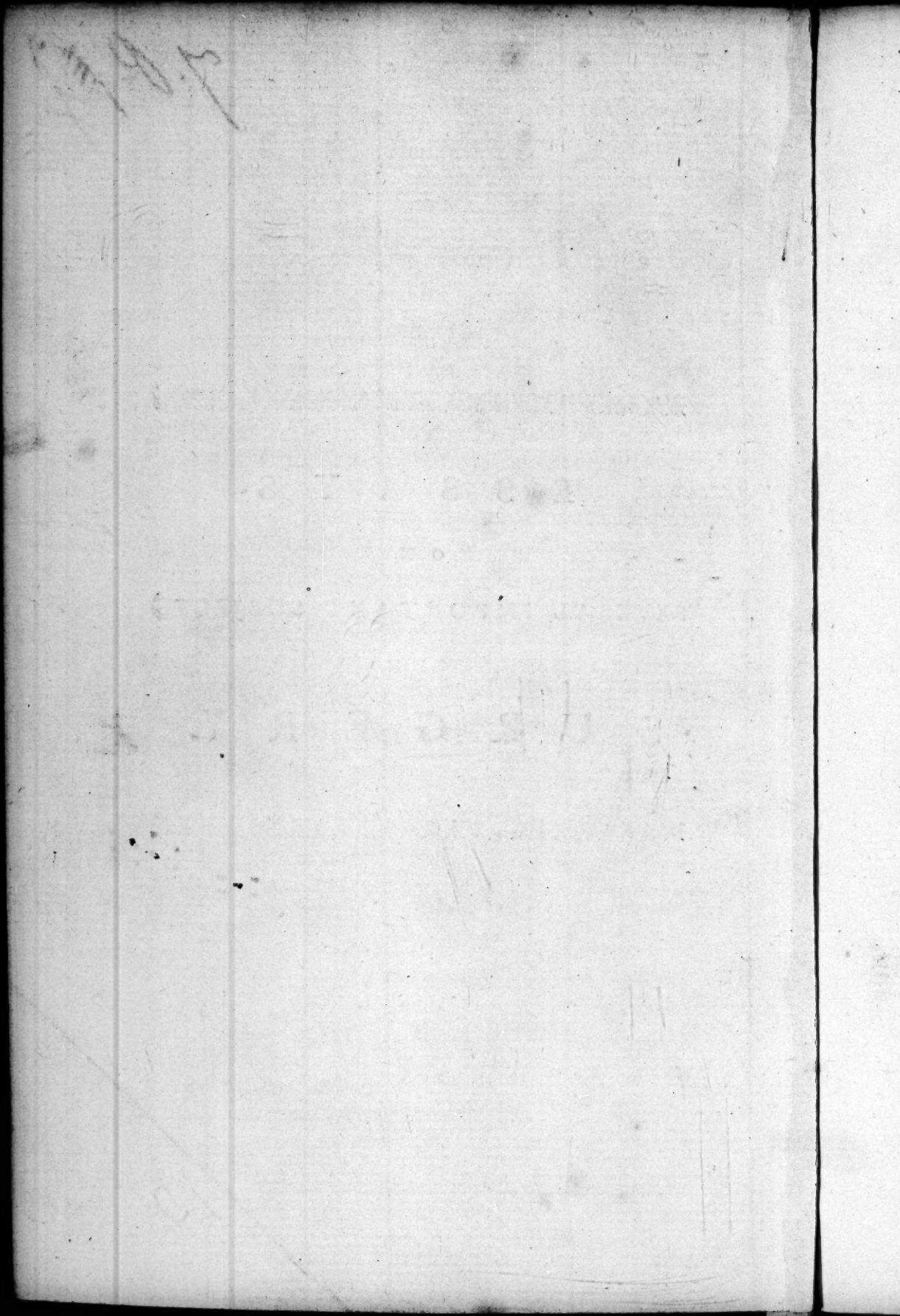


7 *Page*



ESSAYS
ON
SEVERAL IMPORTANT SUBJECTS
IN
SURGERY.





709
E S S A Y S
O N
SEVERAL IMPORTANT SUBJECTS
I N
S U R G E R Y:

Chiefly on the Nature and Cure of FRACTURES
of the long Bones of the Extremities, particularly those
of the Thigh and Leg, whether simple or compound;
for which A NEW METHOD of RETENTION is proposed,

The whole illustrated with COPPER-PLATES.

B Y
JOHN AITKEN, SURGEON,
Of the College and Incorporation of SURGEONS
in EDINBURGH.

*Ad utilitatem vitæ, omnia consilia, factaque nostra dirigenda sunt. TACIT.
Res, ætas, usus, semper aliquid adportat novi. TERENT.*

L O N D O N:

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M,DCC,LXXI.

13



Entered in Stationers Hall.

TO
DR ALEXANDER MONRO,
PHYSICIAN AND PROFESSOR
OF
MEDICINE AND ANATOMY
IN THE
UNIVERSITY OF EDINBURGH,
OF
ABILITIES AND REPUTATION
IN HIS PROFESSION,
FAR TOO EMINENT FOR A PARTICULAR
ENCOMIUM IN THIS PLACE;
THE FOLLOWING ESSAYS
ARE MOST RESPECTFULLY
INSCRIBED,
BY
THE AUTHOR.

T O

Dr. ALEXANDER MONRO

Physician and Professor

OF

MEDICINE AND ANATOMY

IN THE

UNIVERSITY OF EDINBURGH

A FIFTIETH EDITION

IN HIS PROTESTANT

FOR TOO KNOWN FOR A PARTICULAR

ENTHUSIASM IN THIS PLACE

THE FOLLOWING ESSAYS

ARE MOST RESPECTFULLY

INSCRIBED

BY

THE AUTHOR

For the preliminary pathological and physiological remarks, he has generally quoted his authorities; and will never dispute much with any one about them.

ALTHOUGH many great and illustrious Surgeons, ancient as well as modern, have very much laboured this subject; still it is surely very far from having attained to that degree of improvement of which it is susceptible. That it is very much promoted, far less exhausted, by the present attempt, the Author has not the vanity once to imagine. He, however, humbly hopes, that, provided the methods proposed for effecting retention of fractures of the thigh and leg bones, whether simple or compound, on fair and candid trial,

trial, recommend themselves as much to the experience of others as to his; his feeble efforts towards improving a branch of an art, allowed by all to be highly important and useful, and of which he has long been peculiarly fond,—will not be altogether destitute of general usefulness.

THE prosecution of the same principle, upon which the method proposed for accomplishing retention of the fragments of the thigh and leg bones, is founded,—naturally suggested the subjects of the other essays, (that on teeth-drawing excepted). In these the author has ventured to make some proposals, which, as yet, he has not had an opportunity really to put in practice; however, they are only mentioned

tioned as probable and rational,—to stand or fall by the only infallible test, candid experiment.

THE Author declines particularly to mention the approbation which Gentlemen, not of the lowest rank in their profession, have bestowed on some of what he calls improvements : as he is altogether persuaded, that no authority, however great (that of a MONRO not excepted), is sufficient long to support any pretensions to improvement, however specious, unless founded on experience and utility ; and such as are so,

Tali auxilio—non egent.

To those who are of opinion (if any such there be), that none whose locks are not silvered over with age, should
venture

venture to commence author,—the words of *Quintilian* shall be an apology, as well for the Author as for his performance.

“ Quæ præsentī opusculo desunt, suppleat ætas; non enim differendum est tyrocinium in senectutem. Nam quotidie crescit metus, majusque fit semper quod ausuri sumus: et dum deliberamus quando incipiendum, incipere jam ferum fit. Quare fructum studiorum viridem, et adhuc dulcem, promi decet; dum et venia et spes est, et paratus favor, et audere non dedecet.

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of

Of FRACTURES in general.

INTRODUCTION.

THE bones are the hardest, most solid, and least flexible parts of the animal body *; constituting, as it were, the *fundamina* of the whole œconomy; at once imparting firmness and stability to the wonderful fabric.

As services so important, and so essential to all the functions, are thus performed by the bones, especially by those of the limbs; for the most evi-

A dent

* Prof. Monro's Osteology. p. 6.

Os est pars nostri corporis durissima, siccissima, et flecti minime apta. Commer. literar. Noremberg Vol. ix.

dent reasons it follows, that their diseases in general, and *fractures* in particular, must be productive of disorders very interesting to the whole frame.

To conduct the cure of the various fractures, therefore, with propriety, at the same time restoring and preserving, as much as possible, the beauty and natural form of the human figure,—has ever been regarded as no inferior department of the Surgeon's art.

IN the greatest part of the following pages, are presented some remarks on the treatment and cure of fractures; chiefly as happening to the long bones of the extremities.

ALTHOUGH the idea meant to be conveyed by the term *fracture*, thus employed

employed to mark a disease of the bones, may seem very familiar, and abundantly comprehensible even to the youngest tyro in surgery; yet, previous to any observations on the treatment of this disease, for his amusement at least, if not instruction, it was judged no way improper to offer a definition of this term; and also, to subjoin a few cursory physiological and pathological remarks on some conditions and circumstances of the bones which appear to have a connection with this subject, and an acquaintance with which may sometimes not a little influence the Surgeon in forming a just *prognosis*; and, what is of much greater consequence, in adopting a proper method of cure.

DEFI-

DEFINITION of FRACTURE.

“ A SEPARATION of the parts of a bone, by violence, from their cohesion, into large portions or fragments*, ” is the concise, tho’ accurate and comprehensive definition of a fractured bone, given by the truly illustrious Dr CULLEN, our esteemed Preceptor ; which I readily adopt,—for who can give a better one?

IF a power act on any piece of matter, with force sufficient to separate or distract its component particles beyond that degree of contact which is necessary to their cohesion; it is evident that a division of such piece of matter into two
or

* Ossis partes a cohaesione in magna fragmenta vi solutae. Cullen Gen. Morb. Gen. cxxxi.

Ossis substantiae vi externa soluta unitas facta.—Commer. literar Norimberg. loco citat.

or more portions must unavoidably ensue*.

WHEN an animal body is thus acted upon by such a power, a violent separation, division, or solution of the continuity of its substance, will in like manner be effected.—According as the texture of the part so divided is more or less compact, the division has obtained various names from Pathologists. Thus, if a soft part is divided, they call it *Rupture*, *Laceration*, *Wound*, &c. If a part of more compact texture, as a bone or tendon, it is called *Fracture* †.

THAT the cohesion of the particles of bones is the resistance to be overcome by fracturing powers, is obvious from the definition; and that according

* Cum ablata (vel destructa) cohaesio concipiatur, solidi idea evanescit.—*Illust. Gaub. Pathol. Sect. 152.*

† *Illust. Gaub. Pathol. Sect. 217.*

ing to the degree of this cohesion such powers will, with more or less facility, effect the division of the bones, is equally obvious.

Of the Cohesion of the osseous Matter.

THE cohesion of matter in general is, that affection of it whereby, in consequence of nature's universal law, Attraction, its component particles are determined to cohere and to form masses; whose magnitudes are more or less great, according to circumstances. The cohesion, then, of the osseous matter, is naturally referable to the energy of this so general law over it.

ALTHO' the absolute cohesion of the particles of the bones of old animals, appears to be considerably greater than that of those of younger ones*; yet, to the most

* Prof. Monro's Osteol. p. 53.

most common cause inducing fracture, those of the former are found, by experience, to be far more fragile than those of the latter*.

THIS difference so remarkable between these two conditions of the bones, is perhaps to be intirely ascribed to some degree of *pliancy* or *tenacity* which the bones of young animals possess, and of which they are afterwards deprived by age. On what this circumstance depends, will be inquired into hereafter.

IN consequence of this *pliancy* or *tenacity*, young bones are qualified to yield considerably to the action of a *vis percutiens*, such as that of a stroke by or against any hard body, (which is a very common

* Tanto levioribus causis fractura nascitur quo ossa ex senio, &c. fragiliora sunt.—*Illust. Gaub. Pathol. Sect. 217.*

See notes in page 25.

common cause of fracture) and thus better enabled to elude its fracturing power, than the more rigid and more firmlycohering old bones,—altho' these latter would probably give most resistance to a *vis distrahens*.

Of the Rigidity of the BONES.

ACCORDING to some Philosophers, it is only necessary that the simple homogeneous particles of matter be brought into contact, and the firmest possible cohesion will be thereby formed, or they will be mutually very strongly attracted, and form a mass perfectly solid.

FROM this doctrine, it is a very evident consequence,—that the more the proportion of the earthy particles in bones

bones is increased to that of their other component parts, these earthy particles will approach the nearer to one another, or be mutually attracted with greater power, and consequently cohere more firmly. In this manner, it would seem, is generated that quality of bones which is known by the term *Rigidity*; and to which their fragility is always in proportion*.

FROM the first moment of conception,
D on,

* Cohæſionem *intractabilem* terra mera facit. Sufficit huic proximus ſuarum particularum contactus ad cohaerendum: alienorum interventus cohaëſionem modo attemperat; quæ tanto laxior eſt, quo iſtarum ad terram major ratio.

Conſtat, partium humani corporis materiaturam ubique eandem eſſe, elementa eadem, differentiam vero horum proportioni deberi. Abundans ficcum (*vel terra*) firmitatem (*vel rigiditatem*) effecit. — Gaub. Pathol. Sect. 143-146.

In univerſo corpore portio elementi terrei augetur, unde offium fragilitas increſcit. — Haller Prim. lin. Phyſiol.. Sect. dcccclxviii.

on, to the utmost verge of life, by the gradual accumulation of earthy matter,—the process to rigidity is constantly advancing, not only in the bony, but also in the softer parts of all animal bodies. To this change is chiefly, and perhaps solely, to be attributed the very remarkable diminution of irritability and vascular texture, which is observed to take place in all aged animals: All the parts of their bodies thus approaching, as it were, to solidity.

PARTS naturally soft have now become bony; while the bones themselves have acquired a surprising degree of hardness and solidity, consisting almost totally of perfect earth*. In this way, it is that animation, of necessity, and
as

* Profes. Monro's Osteol. p. 17.

Haller Prim. lin. Physiol. Sect. dcccclxviii.—lxxii.

Commer. literar. Norimb. vol. ix. p. 354.

as it were spontaneously terminates; or death, merely from age, follows; when, in a most literal sense, “Dust returns to dust.”

THIS great accumulation of the earthy principle in bones, would seem to be the cause producing that extreme rigidity and fragility, which those of very old people are observed to possess. To the almost total abolition of their vascular structure, may, perhaps, in a great measure, be imputed the tedious formation, and sometimes absolute defect, of *callus*, observable in the fractured bones of such people.

FROM the above observations, the reason will in part be abundantly evident,—why the bones of old animals, or those in the condition now described, are fractured with greater facility

ty, from equal causes, than those of younger ones.

Of the Tenacity of the BONES.

It has been taken notice of above, that the quality of tenacity is more prevalent in young than in old bones; communicating to the former the pliancy, which, in a degree much superior to the latter, they are found to possess. It remains, therefore, to investigate what may most probably be the reason of this difference between these two states of the bones.

IN the very young *fœtus*, the rudiments of the future bones are discovered, by dissection, altogether to consist

sist of a *mucus* ; which next assumes the appearance of a transparent jelly or gluten*.

AMONG this gluten, which seems to be analogous to, or the same with, the coagulable part of the animal fluids, the earthy principle or osseous matter is determined to collect, and to form incipient ossifications ; or, as Anatomists chuse to speak, *Nuclei*†.

THE wonderful determination of the osseous matter to those parts of the embryo only, which the necessities of the œconomy require to be rigid and bony, by the operation of the omnific hand of nature's Architect ; like every other

* Omnino tenerorum foetuum ossa merum sunt gluten; fluidum primo, inde collae simile. Haller. physiolog.

° Prof. Monro's Osteology. p. 32.

† Haller. prim. lin. physiolog. Sect. pccccxv. 19.

other circumstance in our formation, cannot fail to suggest delightful reflections to the contemplative mind.

PRECISELY in the same proportion as this ossifying process advances, the original gluten and vascular structure of the bones are extinguished;—for this reason it chiefly is, that, in very aged animals, they are found to have become extremely brittle, and to have acquired an almost flinty hardness.

As young bones, at the same time that they possess a greater degree of tenacity than old ones, are observed to abound with a remarkably greater quantity of this gluten; and as whatever has power to diminish the quantity of their gluten, or to alter and vitiate its nature, (which, as will be mentioned hereafter, many diseases have) also diminishes, at the same time, their

their tenacity, or increases their fragility: It appears highly probable, that this quality depends almost entirely on the gluten, and is very much influenced both by its state and quantity; and that the superior tenacity of young bones may justly be ascribed to the superior quantity of this gluten interposed betwixt the earthy or osseous particles in their composition, which, by experiment, is found really to be the case*.

THE greatest resistance which the bones can oppose to fracturing powers

* Gluten terreas partes aduniens et firmans, baseos ergo locum praebet *tenacitati* ossium, et impedimento est; quo minus evadant arida et fragilia. — Hoc quoque videre licet in ossibus calcinatis, quae saepius solo contactu digitorum diffinguntur, et in pulverem fatiscunt.

Quo plures partes oleosae, aquosae, et salinae (*which, according to this Author, constitute the gluten*) adfunt in substantia ossis, eo firmior est ejus cohaesio, (*according to us, eo major est ejus tenacitas*), et vice versa.—Commer. literar. Noremberg. Vol. ix. p. 354.

ers seems not to result, either from the qualities of tenacity or rigidity singly considered, but from a certain combination of both; and this may justly be presumed to be most compleat at that period of life when every other part of the system is fully evolved and in greatest perfection, viz. at Puberty.

Of the Oil, or Medulla of the BONES.

AFTER the system has reached its summit of increment, the gluten of the bones would appear to be much diminished*; but the equable distribution of the oily or medullary particles, every where in their substance†, which
now

* Senium gelatinam minuit. — Haller. prim. lin. Physiolog. Sect. cl.

† Prof. Monro's Osteol. p. 21.

now takes place, must contribute very much to preserve their tenacity ; or to ward off fragility, and the other consequences of age, much longer than would otherwise happen. After this period, therefore, the resistance which the bones make to fracturing powers, they owe in no small degree to the general distribution of this oil through their substance ; and this is doubtless a chief purpose for which so much of it is collected within all the bones.

IN the bones of very young animals this oil is found only in small quantity, and is very imperfect in its nature ; but in those of such as are grown up, it is much more abundant and pure ; as if Nature, by this means, intended to counter-balance the gradual diminution of their glutinous part.

By great age even this oil is either totally wasted, or remains only in very small quantity. This circumstance enables us to understand the reason, why the bones of very old people are so extremely brittle; and why their reunion, if they admit of any, must be very tedious*.

Of Causes inducing Fragility, or predisposing to Fracture, of the BONES.

It must be confessed, that the causes immediately occasional of fracture, very often act with such irresistible violence and impetuosity, that were the bones

* Senibus ossa facilius franguntur quam junioribus, quoniam ossa juniorum plus aquosae pinguedinis possident; hinc mitiora sunt, et vi externae facilius cedunt; quum contra in senioribus pinguedo sensim sensimque evanescit, hinc ossa duriora et fragiliora evadunt.—Commer. literar. Norimberg. Vol. ix. p. 354.

bones much stronger than they naturally are, they must instantly be divided; independently of any pre-disposition whatever, or without the concurrence of any of the pre-disposing circumstances after mentioned. Nothing is however more true, than that the natural fragility of the bones is, from certain morbid *diatheses* or conditions of the general habit, very much increased: for this reason they are more exposed to fracture, and when broken, their cure, or the reunion of their fragments, is found to be always tedious in proportion to the prevalence of such *diatheses*.

ATTENTION to this circumstance is of no small importance in practice; and is a chief reason why some of the morbid states of the system, reckoned peculiarly productive of this fragility or pre-disposition to fracture, are enumerated below.

IT

IT has already been remarked, that the tenacity of the bones, so instrumental in resisting the action of fracturing powers, depends greatly, or perhaps intirely, on the state and quantity of their *gluten* and medullary oil. If this doctrine is well founded, it may be concluded,—that the diseases which have a tendency to vitiate, diminish, or destroy these component parts of the bones, must, at the same time, and in the same degree, induce fragility pre-disposing to fracture.

THE diseases or morbid *diatheses* of the general habit here principally alluded to, are characterised by pathological writers under the following heads, viz. the *siphylitic* or *venereal*, the *putrescent* or *scorbutic*, the *arthritic* or *gouty*, the *strumous* or *scrophulous*, and the *rachitic* or *rickety**: to these some have

* Eandem qualitatem (i. e. *fragilitatem*) acquirere possunt

have added the *carcinomatous* or *cancerous**.

It would doubtless be greatly foreign to the plan of this treatise, to institute a nice investigation respecting the existence and different natures of these

possunt ossa a constitutione praeternaturali; ubi scilicet humores, vel majorem quantitatem partium terrearum possident, vel gluten non satis pingue ac viscidum est: qualis praeternaturalis constitutio observatur; 1. in *lue venerea* affectis. 2. in infantibus *rachiticis*. 3. in iis qui humoribus *strumosis* sunt obnoxii.—4. in *scorbuticis*. 5. quorum sanguis accumulatis impuritatibus viscidis scatet, v. g. rheumatismo vel *arthritide* correptis.—Commer. literar. Noremberg. Vol. 9. p. 354.

Quando neque *scorbutica*, neque *strumosa*, neque *rachitica* causa patet, tunc caries *venerea* censenda, fragilitas ossium diagnosim certam praebet.—cl. Home Princip. medic. de lue venerea.

* Voila donc la fragilité des os, qui est l'effet de leur sécheresse, causée par l'alteration des sucs moelleux—Observations sur les effets du virus cancéreux, par M. Louis of the French academy of surgery.

these vices or morbid states of the system; or minutely to mark their limits and characteristic distinctions: let it suffice in general to say—that it is highly probable certain *acrimonies* either attend or are generated by all or most of these diseases; capable to alter, deprave, and sometimes entirely to destroy the nature and *crasis* of the fluids in general, and of their glutinous and oily parts in particular; thus inducing the morbid fragility of the bones in question.

IN some cases, the texture of the bones has been so much perverted,—as from the smallest violence, and even muscular effort, to suffer fracture*.

Fractures

* *Offa nonnunquam fragilia ad minimum ictum, nonnunquam mollia instar cerae deveniunt.*—Home, *Princip. medicin.* loco citat.

Mr Gooch's cases and remarks, Vol. I. p. 398.

Fractures from external violence are only meant to be comprehended under our definition ; and indeed, with propriety, such only fall within the Surgeon's province. Fractures arising from internal causes, are to be regarded merely as *symptoms* depending on some such primary and general diseases of the system as are recited above ; which, previous to the cure of the fractures, must be either corrected or eradicated by medicine.

Old age, and whatever has the same effects on the body, as *long continued and hard labour*,—are observed to increase the fragility of the bones*.

AN intensely cold or *frosty state* of the atmosphere has been thought, in like

* Prof. *Monro's Osteology*, p. 18.

Fragilitas ossium in statu sano senio fere propria est—
Commer. literar. Norimberg. Vol. ix. p. 354.

like manner, to render the bones more than ordinarily fragile*. The frequency of fractures, during frosty weather, seems to have given rise to this opinion;—the greater slipperiness and hardness of the earth in this than in soft weather, the one occasioning more falls, and the other more fractures, sufficiently account for this fact, independent of the notion of increased fragility.

Of the Nature and Formation of Callus.

THE Author of nature has wisely and wonderfully implanted powers in the

* Tanto levioribus causis fractura nascitur, quo ossa ex senio, *acri gelu*, lue venerea, scorbuto, arthritide, rachitide, carie, aliove vitio, fragiliora sunt.—Gaub. Pathol. Sect. 217.

the animal system, capable of repairing loss of substance and other injuries which it may suffer, to a certain extent, and under certain circumstances. Of these, surprising exertions are every day to be observed in many parts of it; but no instances of this kind are more remarkable than the *exfoliation*, and consequent *regeneration* of large portions of the bones,—and the firm *re-union* of their several pieces after fractures.

THE substance, by whose intervention the concretion of the fragments of the bones is effected, is named *Callus**.

AUTHORS are much divided about the source whence the callus flows:

F

while

* Les vuides qui pourroient se trouver entre les pieces fracturées, sont remplis d'une substance organisée, (*callus*) analogue a l'os, et qui le soude enfin a l'endroit de la fracture.—*M. Petit sur les maladies des os. Tom. 2. p. 51.*

while *M. de Hamel* contends, that it is furnished solely from the periosteum; the learned and indefatigable *Haller*, with greater probability, asserts, that it is only effused from the substance of the fractured bones*.

When

* Succum ossium crassioribus particulis gravem inter fibras primaevae disponi, calli subnascentis phaenomena declarant, qui ex *intimo osse*, non ex periosteio, guttulis quibusdam exsudat, et sensim induratur.—*Haller, prim. lin. physiol.* DCCCCXVIII.

Our late celebrated Prof. *Monro* seems to have been much of this opinion. His words are:—"That the part of a bone formerly fractured and re-united by a callus must be stronger than it was before the fracture happened, which is a wise provision, since bones are never set in such a good direction as they were naturally of; and then, when even a callus is formed, there is such an obstruction of the vessels, that if the bone was again broke in the same place, the ossific matter would not be so easily conveyed to re-unite it."—*Prof. Mon. Osteol. p. 26.*

His traditis ad calli examen progredi licet, atque concludere duplice callo inter se unire fracta. Externo qui ex gelatina intra periosteum, ex vasis, seu fibris ossis exstillanti, gradatim in os condensatum fit, quem-ad-modum
omnis

WHEN newly effused, this matter is found to have an appearance similar to the *mucus* or *gluten*, the rudiments of the future bones in the very young foetus before mentioned: by degrees, from the accession of the ossific matter, it soon becomes equal to the bones themselves in hardness and solidity.

THE young callus, however, never assumes the osseous nature,—till it has been pervaded by the vessels carrying red blood, shooting from the neighbouring parts*. By this means it acquires an organization analogous, though inferior in degree, to that which the bones naturally enjoy.

The

omnis ossificatio; et interno, seu internarum lamellarum ossiarum separatione atque elongatione.—*Edinburgh essays, physical and literary, Vol. III. Article xxviii. Dom. Pet. Camper. Observationes circa callum ossium fractorum,*

* Callus osseus nunquam convalescit, nisi cum rubra vasa nuper subnata penetraverunt.—*Haller, prim, lin. physiol. dccccxvi.*

THE morbid states of the system already enumerated, as pre-disponent to fracture, also greatly influence the formation of *callus*. Sometimes they not only retard, but altogether prevent it. The scorbutic *diathesis* is particularly fatal to the growth of *callus*; it has been observed to destroy it in its most confirmed state; fractures, after having been re-united for many years, have appeared in consequence of this affection as if recent*.

It is alledged, that the state of *pregnancy* is unfavourable to the production and perfecting of *callus*; and, for this reason, fractures happening during that period are said to admit only of very slow cure.

THE time requisite to confirm or perfect the *callus*, after fractures, must be

* See the History of Lord Anson's voyages.

be different in the different bones; and in patients of different ages and constitutions: At a medium, it has been supposed, that the fractured *radius* may unite within a month, ; the *ulna* and *humerus* within two months; the *os femoris* seldom under seven, or perhaps ten weeks*.

As the formation of callus is thus altogether Nature's work, and cannot be influenced by artificial means; the absurdity of all topical and quackish applications, as well as internal remedies, with a view to hasten it, or, when formed, to dissolve or soften it,—is too self-evident to require illustration†.

Of

* Dr James's medical dictionary under the word Fracture.

† Quid porro manifestius est, quam fracta postquam confervuerunt valentiora reddi? quid, contra, absurdius quam credere, callum jam formatum, remediis externis mercurialibus, balneis vaporosis, vel aqua calida fotum, dissolvi

Of the Symptoms of Fracture, with their Rationalia.

IF the power or violence inflicting fractures, at the same time makes a wound or opening in the integuments and muscular parts,—or, if the fragments are pushed through these, so as to be seen or felt; they are said to be *compound* or *complicated*;—in opposition to those un-attended with this circumstance, which are therefore named *simple*.

Respecting

diffolvi ac mollescere posse? quid tandem ab ipsa natura magis alienum, quam remediis externis calli generationem adjuvare velle?

Nemo adeo infanus est, confido, qui his perspectis, remedia specifica callum generantia intus propinare; aut ex signis ab auctoribus prolatis judicare auit, utrum jam factus sit callus, nec ne? — *Edinburgh essays physical and literary, Vol. III. Art. xxviii. Dom. Pet. Camper, Observationes circa callum ossium fractorum.*

See Dr Alston's materia medica, under the article *sarcacolla*.

RESPECTING the existence or non-existence of compound fractures, even the least versant in this subject can have no doubts; they are self-evident. In simple fractures this is however far from being always the case: instances are not wanting, where *contusions* have been mistaken for, and treated as fractures; and where, on the other hand, fractures have been regarded as dislocations, contusions, sprains,—and the error detected too late to admit of remedy. Some circumstances, indeed, such as, the natural thickness of the surrounding parts, corpulency, the accession of much swelling and tension before examination,—often occasion abundant perplexity to the more experienced; before they can with certainty determine, what the state of the parts really is.

IF a cause, supposed equal to inflict fracture, has affected any part of a limb ;

limb ; a presumption immediately arises, that its bone or bones may be fractured. This is determined to be or not to be the case, from its being or not being followed with some of the principal symptoms attending this affection enumerated below ; all, or the greatest part of which concurring, are sufficient to ascertain the presence of fracture : Some of them singly are altogether decisive.

1. VERY acute and pungent pain about the suspected place ; especially when the parts are moved, or pressed with the hand.

2. A GRATING of the fragments on one another is often to be perceived, and even heard ; when the fragments are much displaced, the inequality thence resulting is often to be felt with the fingers.

3. Confide-

3. CONSIDERABLE swelling, tension and inflammation, very soon occupy the surrounding parts.

4. INABILITY to perform any motion with that portion of the limb, which is below the supposed seat of the fracture; this portion is sometimes affected with numbness, or partial palsy.

5. WHEN the affected part or limb is carefully compared with the corresponding part of the sound limb, or with the sound limb itself,—a preternatural alteration of form, such as curvature or shortening, is often observable.

THE *rationalia* of all or greatest part of these symptoms, diagnostic of fracture, will easily be collected from the following observations:

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ALTHOUGH the bones themselves, for obvious reasons, are insensible; the violence done to the medullary membrane, to the periosteum, but more especially to the highly sensible moving or muscular parts, must create acute and pungent pain—particularly, when farther disturbed by motion or pressure.

THE pointed fragments which, from contact only, must be extremely irritating, sometimes penetrate very considerably into the surrounding muscular substance,—and thus become a *stimulus* strong, direct, and constant; causing an increased determination of blood and nervous influence to the surrounding parts, productive of sudden swelling, tension, and inflammation,—often terminating in large suppurations, &c.

FOR

FOR the same reasons, the *vis insita musculorum*, or natural contractility of the moving fibres, is much excited; and being now, in a great measure, unresisted by the bones, their fragments are often obliged to over-top or pass one another,—thus occasioning curvature, shortening or other distortion of the part or member. If adjacent nerves happen to be compressed by the fragments, numbness of the parts supplied by them, or partial palsy, is a necessary consequence.

THE oscillatory motions of the *vasa minima* near the fracture, from the same causes, are also very much increased; generating, what may very properly be called a *topical fever*: in many cases this becomes so considerable, as to be able to propagate itself generally over the system; or to induce increased action of the heart and larger

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er arteries, so well known by the appellation of *sympathic* or *sympomatic* fever.

Of the Prognosis of Fractures.

FRACTURES, with respect to the surrounding parts, as has been already said, are divided into *simple* and *compound*; with respect to the bones, they may also be divided very properly into *transverse*, (Plate I. Fig. I. c.) and *oblique*, (Plate I. Fig. I. b.)

FRACTURES are more or less dangerous and molesting, according to the degree of violence which the surrounding parts have suffered; for this reason, such as are joined with wounds or contusions of these parts, as the compound, or those nearly so,—are
more

more dangerous, tedious and troublesome in their consequences than the merely simple.

IN the wounds attending compound fractures, the extremities of the fragments would seem, for some time at least, to act as extraneous bodies. Untill they are covered with granulations, the discharge induced and kept up by their constant irritation, especially if the parts are moved,—is often so immoderate and excessive, as very soon to weaken the patients.

THE general debility of the system, a necessary consequence of the great discharge which so often attends wounds of this kind, together with *absorption* from them,—almost always induce *hectic fever*, and its very troublesome concomitants, *diarrhœa*, &c. The motion unavoidably attending *diarrhœa*, unfortunately

unately augments both the irritation from the fragments, and the discharge from the wounds ; and is, at the same time, most unfriendly to the retention and concreting of the fragments,—and makes a great addition to the difficulty otherwise attending the retentive part of the healing process. Indeed such cases but too often terminate fatally.

TRANSVERSE fractures of all others, for very evident reasons, are ofteneft speedily and happily cured. Oblique fractures, on the other hand, much feldomer complete the patient's and furgeon's wishes ; in spite of the circumfpection of both, deformity is not unfrequently the consequence: The want of fuccefs would appear to be in proportion to the degree of obliquity ; When this is confiderable, the fragments are, with greater difficulty, preferved
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in proper opposition, and their extremities are more acute; and, on this account, when displaced, they prove more stimulant and destructive to the fleshy parts.

THE consequences of inflammation excited in or near the articulations, on account of the peculiar nature of their constituent parts, is always to be dreaded. Fractures, therefore, near the extremities of the bones, are likely to be more dangerous than elsewhere. It is needless to add, that if the same bone is fractured in more places than one, the danger will be more than proportionally increased.

THE above prognostics only regard the state of the fractures; but the age and constitution of the patients are particularly to be taken into the account. Patients young, and otherwise

wise healthy, with greater reason and confidence may expect a successful cure, of whatever kind the fractures are, than such as are old and diseased.

—Fracture, concurring with great age and depraved habit, constitute a case truly deplorable.

Of the Method of Cure, or Treatment of Fractures.

AFTER being fully convinced, from the concomitant symptoms, that a bone is fractured; the Surgeon's business is to reduce its fragments to their natural situation,—and there to retain them, by proper means, till Nature, by the interposition of callus, completes the cure.

This

THIS part of our subject naturally divides itself into three branches; *Extension, Coaptation and Retention.*

EXTENSION.

THE contractility or *vis insita* of the muscular fibres, during life, is constantly exerted; or the muscles have a constant tendency to shorten themselves*, as far as their structure permits: this is only prevented, beyond a certain degree, by the resistance which the bones oppose to it.—When therefore the bones are fractured obliquely, or indeed transversely, provided the fracturing cause has sufficiently disengaged the fragments from one another,—the resistance will be, in a great measure, removed; at the same

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* See *Institutions of Medicine for the use of the Students in the University of Edinburgh.* p. 63.

time that the muscular power, from the strong and rude *stimulus* of the fragments, is much excited: by this means, the lower fragments are very often forced to over-lop the upper ones. To reduce these, extension becomes absolutely necessary; and ought to be proportioned to the resistance, which is as the connecting muscles.

IN some favourable transverse fractures, the bones are simply fractured, and no displacement ensues. This circumstance plainly supercedes the necessity of extension.

As the business of extension is to reduce the lower fragments, which, for reasons adduced, can only be displaced,—it is easy to perceive, that there can be no place for what is called *counter-extension*: if any idea is conveyed

ed by this term, it seems only to be the retracting of the upper fragments.

IN performing extension, the upper fragments must be fixed, or held steadily in one posture. The traction, or extending power, whether the hands or mechanical assistance, is to be applied to the lower fragments only; for no good reason can be assigned, why, by applying it to a more distant part of the limb, the intervening articulations should be racked and strained, and perhaps luxation added to fracture.

FOR another, and perhaps more important reason, the application of the extending power to a distant part of the limb, is highly improper and unscientific, *viz.* the muscles, by this procedure, are all put on the stretch, and their tension infallibly increased; and

and consequently the resistance to the traction considerably augmented, which by every possible means should carefully be diminished.

A CONSIDERABLE relaxation of the muscles of the leg and arm is obtained, by keeping the knee and elbow joints in a state of flexion while extension is performing: this circumstance deserves to be particularly attended to. If a joint intervenes betwixt the fracture and the part to which the extending power is applied, a few supposable cases excepted,—this relaxation is not to be effected.

ALTHOUGH this practice of relaxing the muscles to facilitate the extension, as well as retention of fractured bones, stands supported by anatomical arguments and common sense,—it has been much over-looked by the generality

lity of authors. Some, indeed, have mentioned it*; but the many advantages resulting from it have never been fully taught by any author, so far as we know, before Mr Pot†; to whose judicious observations, on this and other subjects, surgery is much indebted.

To accomplish extension, our tractive efforts should at first be gentle, cautious and steady; and, as may be necessary, gradually increased. The strength of the hands will almost always be found sufficient for this purpose; where it is so, it is constantly to be preferred to every contrivance whatever.

* Il faut que les muscles soient autant qu'il est possible dans un état d'inaction, et qu'ils soient tous également relâchés.—*M. Petit, sur les maladies des os, Tom. 2. p. 31.*

See the *Encyclopedie*, under the word *Fracture*.

† See his general remarks on fractures, *passim*.

whatever. In fractures of the thigh-bone, whose surrounding muscles are by far thicker and stronger than those of any other part of the extremities,—I have always, with one or two assistants, been able to effect due extension; though, at the same time, I am far from doubting, that, in some muscular robust patients, the assistance of the mechanical powers may be found necessary; especially when the neck of the thigh-bone is the seat of the fracture.

It is very material, carefully to attend to the proper time of operating the extension; it should always be performed as soon after the accident as possible, previous to the accession of the tension and inflammation. If, however, these are present in any considerable degree, before assistance has been procured; it will be prudent not to attempt extension, till these symptoms
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are either mitigated or altogether removed: otherwise our attempts are likely not only to prove vain, but extremely hurtful; from such procedure an increase of the symptoms is but a natural consequence.

THE tension and inflammation are most likely to be mitigated or removed by a strict observance of the *anti-phlogistic regimen* in all its parts; particularly blood-letting. In sanguine, robust, young habits,—copious blood-lettings, both general and topical, will be very expedient; no remedy whatever so effectually reduces the tone of the arterial system, or so powerfully destroys the *inflammatory diathesis*. As very much contributing to the same end, the application of large, emollient, or relaxant cataplasms to the fractured part, is to be persisted in. Their operation will be increased by applying

ing them gently warmed, and frequently renewing them. This is perhaps preferable to the more common mode of fomentation ; as its relaxing effects are more permanent. *Saccharum saturni* in dilute solution is an useful addition to the cataplasms*.

FOR determining the quantity of extension, the rule is,—to proceed till the next step in the curative process can be properly accomplished, viz.

COAPTATION.

COAPTATION, or setting of the reduced fragments, ought to be executed with all possible accuracy and attention ; on it the future shape, and perhaps usefulness of the limb may, in a great degree, depend.

Accurate

* See Goulard's treatise de l'extrait de sacch. saturni.

ACCURATE anatomical acquaintance with the structure of the parts concerned, will here be the Surgeon's best assistant; some information may be gained, by carefully comparing the affected with the corresponding sound limb.

THE other steps in the treatment of fractures are, as it were, only subser-
vient to coaptation.—By extension the limb is restored to its due length; by coaptation it regains its natural form; which we endeavour to maintain by the last step, or

RETENTION.

AFTER coaptation, properly to effect the retention of the fragments *in situ*,—is by far the most arduous part of the Surgeon's task, in the manage-

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ment

ment of fractures; unsuccessfulness in this point frustrates all his former labour, and often subjects him to the most mortifying reflections from the concerned.—Although the distortion and deformity, which must be the unavoidable consequence of failure here, may in justice be solely imputable to the imprudent conduct of the patient; or may be the effect of accidents unforeseen, or not to be prevented;—the inconsiderate part of mankind, which is by no means the least numerous, will without hesitation state the whole blame to the Surgeon's account.

SOME of the chief sources whence the difficulty of retention flows, are the following:

1. *The thickness of the surrounding muscles.*—This circumstance, besides increasing the muscular strength or contractile

tractile power, by which the fragments are displaced, adds to the difficulty in another way; by it our retentive applications are kept at too great distance from the fractured bones, whereby their influence is either diminished or totally destroyed: so that when they are made with as great stricture as is compatible with the safety of these surrounding parts themselves, little or no resistance is opposed to the derangement of the fragments. This is peculiarly the case in the thigh; for this reason, by *Hildanus* it is compared to a bone surrounded with a thick pillow*.

2. *The obliquity of the fracture.*—Nothing can be more evident than that the greater this obliquity is, the contractile *nîsus* of the muscles, and derangement of the fragments will be less resisted

* *Hildani opera, Cent. V. Observat. 86.*

resisted and more easily effected; or the difficulty of retention augmented.

3. *The unfavourable external form of the part affected.*—The more this deviates from the cylindrical and approaches to the conical shape, our applications have a more unfavourable hold of the included parts. The form of the thigh is a strong instance of this observation, particularly if the patient is muscular and plump.

4. *The restlessness of patients.*—It is needless to observe, after what has been said, how absolutely necessary to obtain a complete cure, preserving the limb steadily in one situation must be; or how easily, especially in oblique fractures, by the smallest motion, the fragments may be deranged. If, from the thoughtlessness of youth, our patients are fretful and unmanageable,
they

they are surely excusable ; but no apology is sufficient for the peevish discontent, and provoking inattention of such as are more advanced in life.

5. *Accidents*; such as *convulsive startings*, *cough*, and *reaching to vomit*.—All these are very readily induced, in the more delicate or mobile systems, by the *stimulus* of the fragments ; as they occasion much concussion of the whole body, they must of necessity very often derange the fragments after coaptation.—To this head belongs *diarrhœa* ; the cause and molesting nature of which are mentioned above.

FROM these observations, the difficulty of retaining fractured bones *in situ* must be very evident. . Indeed, to effect retention properly has ever been regarded as a very important business ; and has accordingly, at all times, afforded

fording abundant exercise to the invention of the ingenious practical Surgeon,—as will hereafter appear.

Deligation of various kinds, and *Posture*,—comprehend the retentive means employed in fractures.

Deligation.—This includes *bandages* of every kind; as well those made of soft materials, such as cloths of all sorts, &c. as those constructed of harder and more resistant substances, such as leather, wood, metal, &c. called *machines*.

BEFORE giving particular directions for performing deligation, it may not be improper, once for all, to intimate,—that the intention of bandages is, in transverse fractures, to protect the fragments from derangement by *external* causes, which alone can affect them;

them; in oblique fractures, to resist the deranging effects of both *internal* and *external* causes, as they are affected by either. The internal cause here chiefly alluded to, is the contractile *nifus* of the muscles; to which the bones, in a sound state, oppose a resistance. If, therefore, by bandages in oblique fractures, a temporary substitution to the now-deficient resistance of the bones is not afforded,—they must either do mischief, or nothing.

FROM this view of the intention of bandages in the management of fractures, we must certainly conclude, that it can never be completed by such alone as consist altogether of soft and pliant materials. For this reason it is, that *splints* of metal, wood, leather, pasteboard, or the like,—have always made an essential part of the most simple

ple *apparatus* for the retention of fractured bones.

• THE roller-bandages, on account of the motion and disturbance which the fragments must suffer from applying and removing them, are most improper and inconvenient in the cure of fractures ; and are justly superseded by bandages with eighteen or twelve tails,—or others constructed on the same principle, such as those described by Scultetus* and Mr William Sharp†, (Plate I. Fig. 5.): and as, by their means, the state of the fracture can be conveniently and safely inspected; they are peculiarly adapted to the cure of compound fractures,—where the roller-bandages can have no place.

Some

* *Sculteti armament. chirurgicum*, Tabul. xxvii. Fig. 1.

† *Philosophical Transactions*, Vol. 57. Part 2. 1767.

SOME practitioners prefer these bandages when made of flannel, to such as are made of linen cloth,—from an opinion that they can be applied with greater firmness and neatness; at the same time, in case of sudden swelling supervening, they yield a little,—and consequently are not so apt, as the linen ones, to impede the circulation.

THE splints most commonly employed are made of pasteboard. When gently moistened before application, they very perfectly assume the shape of the part included; and thus very much favour and facilitate the retention of the fragments: which, indeed, is chiefly effected by the action of the splints; the bandages may be considered as only subservient.

LEATHER-SPLINTS are extolled by some, as much superior to the pasteboard

board ones ; particularly in compound fractures, where the rigidity of the pasteboard is altogether destroyed by the matter discharged from the wounds,—and by the moist applications that may be necessary*. This is undoubtedly true ; but, in such cases, either of them is much inadequate to the task.

WHETHER the pasteboard or leather splints are employed, they ought to be long enough to reach the full length of the fractured bone, *i. e.* from the joint above to the joint immediately below the place of the fracture. At the same time that these long splints very much contribute to secure the fragments against alteration,—they press less than the short splints commonly used, on the place of the fracture where

* See *Mr Wathen's Conductor and containing splints*, page 13.

where the inflammation and pain are greatest.

As to the requisite number of splints, two of proper breadth are sufficient. They are to be lined with thick compresses of folded linen ; stitching the compresses to the splints greatly facilitates their application. On the back part of one of the splints, ought to be fixed, at proper distances, several straps of strong tape, of such length as to be able to surround the limb, and tie over the opposite splint.

SPLINTS intended for the leg, must have a hole in each of their lower extremities to receive the ancles ; which contribute a good deal to render them more effectual. A splint for the leg, formed in this manner, is represented in Plate I. Fig. 4.

If

IF splints thus constructed are properly applied, scarcely does any further bandaging seem necessary; for it is doubtful, if by it the security against alteration in the state of the fragments can be increased: if, however, any more *apparatus* shall still be thought proper,—the bandages mentioned above, are undoubtedly preferable to those of the roller-kind.

Posture.—It is a very material point, after having proceeded thus far,—to contrive a method of reposing the diseased limb, that may equally quadrate with the curative intention and the patient's ease.

WHEN treating of extension, it was observed,—that a relaxed state of the muscles very much facilitated the retention of the fragments; that posture
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of the limb, therefore, in which the greatest number of muscles are relaxed, is here to be carefully consulted: especially if the patient is muscular, and the fracture oblique.

IF the fracture is ascertained to be of the transverse kind, or nearly so; after the coaptation is properly executed, I know no reason, of any force, why the relaxed state of the muscles should be much regarded. On the contrary, perhaps, their being constantly on the stretch,—by firmly opposing the ends of the fragments to one another, may not a little contribute to retention.

WHEN the arm-bones are fractured, the relaxed state of the muscles is naturally and universally adopted: To say any thing farther on this part of our subject, is therefore altogether unnecessary.

cessary. When the bones of the lower extremities are fractured, it is much more difficult to maintain the muscles relaxed. Mr Pot rests the successful cure of fractures, those of the *os femoris* not excepted, almost totally on the observance of this circumstance: he directs the patient to lie on the side which corresponds with the fractured limb; by which means the limb being laid on its side above a pillow, the knee-joint can be kept in a state of flexion.

It may be objected to this posture of the leg and body, that properly to effect it in common practice is impracticable. The matrafs-bed, on which the patient lies, should be of an equal hardness in every part,—that his body and leg may remain, during the whole cure, in the same plane: for if the body sinks more than the leg, (which it always

always does when laid on beds constructed with the ordinary materials, such as, feathers or chaff,) they soon come to be in very different planes; and thus there is danger of distorting what we meant to rectify. In hospitals, indeed, such equally-hard matras-beds may be purposely constructed; but in common practice the case is very different.

ADMITTING this difficulty, respecting the inequality of the bed, to be surmounted; it may still be said, that lying on the side becomes much sooner irksome than the supine posture: because, in the former situation, the weight of the body is sustained by a less and more unequal surface than in the latter; the arm, also, of the side on which the patient lies,—is so much hampered and confined, as to prevent him from taking diet or medicine,

though

though placed within his reach. That to patients labouring under fractures, a situation as little irksome and inconvenient as possible should be chosen,—is highly expedient ; when it is considered, how tedious the cures often are : and that the smallest alteration of posture, for the sake of ease, will often prove sufficient to defeat all that has previously been done.

It may be here alledged,—that the patient may rest chiefly on his back, and keep his leg, notwithstanding, on its side, in a state of flexion.—This obviates the objection, as to the leg strictly so called ; for undoubtedly the muscles may attain to all the relaxation which posture alone can yield, while the patient remains in a supine situation. This is, however, by no means the case with the thigh ; for unless the patient really inclines very considerably
to

to the side, the strong *musculi adductores femoris* will in some degree be kept on the stretch: when the fracture is in the neck of the thigh-bone, or near its *trochanter major*,—how much this circumstance must counteract the curative intentions, it is easy to conceive. Wounds attending fractures situated on the external parts of the leg, altogether preclude the side-posture.

SURGEONS hitherto have been more employed in adapting their patients, by posture, to the ordinary form of beds,—than of altering and accommodating this form itself.

THE relaxed state of the muscles of the thigh and leg can be obtained, while the patient lies freely on his back, by the following method; against which fewer objections seem to lie than against the other. I have known

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patients

patients remain nine or ten weeks very steadily on their backs ; but never any, for half that time, with such constancy on their sides.

IN fractures of the thigh-bone, the patient's body is to be elevated a foot or eighteen inches above the general surface of the bed. The simplest method of effecting this, is to double up the proper matras of the bed ; so as that the legs, from the knees downwards, may project over the doubled part of it,—to allow of the flexion of the knee-joints. (Plate III. Fig. 2.) By placing the patient in this way, in the day time, the body, by means of a bed-chair, pillows, &c. may, without occasioning the smallest disturbance to the fragments, (unless the fracture is in the neck, or very near the upper part of the bone), be raised to the sitting posture.—How soothing
this

this grateful alternation must be, and how much it will diminish the irksomeness of long confinement,—is easier to be conceived than expressed.

WHEN the fracture is situated below the knee, the leg, from the knee downward, is to be raised and kept in a plane fourteen or fifteen inches higher than the surface of the bed,—that the knee-joint may admit of such a degree of flexion as is sufficient for relaxing the muscles. The height of the one plane above the other, both for the thigh and leg, must be varied according to the size of the patient: this elevation of the leg can be easily effected, by placing pillows above one another, or by any other contrivance which time and place may suggest. (Plate III. Fig. 1.) By this method, also, the patient may be regaled with the same alternation of posture proposed above.

If

IF the dependent situation of the leg, when the thigh is placed as recommended above, should be thought or found to induce swelling, or to increase it; it may be raised nearer to the level of the body, without much disadvantage: for a considerable variation of the angle of flexion has but little influence in stretching or relaxing the femoral muscles.

THE only circumstance that can render the position of the thigh and leg above mentioned impracticable, is the accident of wounds in their back part: in this case, the other method must be adopted. By means of a flat basin and urinal, the *feces* and urine can be received with abundant convenience,—whether the patient be placed in the one or other of these ways.

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OF FRACTURES of the THIGH-BONE.

THE difficulty of conducting the cure of fractures of the thigh-bone, is known and confessed by all*. The genius and invention of the best Surgeons have been much exercised, to devise a method of treatment by which this might be obviated. However, as the number of fractures of this bone is almost equalled by that of consequent deformities, such as, short and decayed legs, &c. the proof that their labours have hitherto

* Neque tamen ignorari oportet, si femur fractum sit, fieri brevius; quia nunquam in antiquum statum revertitur, summisque digitis postea cruris ejus insisti; ex quo multa debilitas est; foedior tamen ubi fortunae negligentia quoque accessit.—*Celsus de medicin.* page 537.

86 *Of Fractures of the Thigh-bone.*

therto been much unsuccessful, is but too plain.

THICKNESS and strength of the surrounding muscles, together with conical shape so peculiar to the thigh,—principally create the difficulty of retention, which always occurs in fractures of this bone; when with these are conjoined obliquity of fracture, and the accidents so often defeating our retentive applications before mentioned,—the task becomes more and more arduous.

FRACTURES in the neck of this bone, which, on account of its spongy texture, happen much oftener than was formerly imagined,—are, from its natural situation, always oblique, with respect to the common *axis* of the bone, and the direction of the femoral muscles, (Plate I. Fig. 1. F.);
this

this circumstance renders the retention of fractures here more difficult—than in any other part of this bone.

THE grand *desideratum* is, by some means or other, to create a temporary substitution to the now deficient opposition which was afforded by the bone to the contractility of the femoral muscles; as well as to prevent derangement of the fragments, from any accidental motion of the leg or body.—Any *apparatus* or mode of dressing for a fractured thigh-bone, incapable of completing these intentions, is evidently very much defective.

THIS substitution to the deficient resistance of the bones, can only be made by assuming two fixed points, the one above and the other below the place of the fracture,—which are to be maintained at the same distance from

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from one another which they held after coaptation, till the reuniting callus is sufficiently confirmed.

UPON this principle, we reject the spica-bandage, junks, and the like; as altogether unequal to retain the fragments in the situation in which they were placed by coaptation.—The patient would undoubtedly be less tormented, and the deformity would not probably be greater,—were the case, after coaptation, intirely committed to nature; and no trial made towards a cure by such inadequate and preposterous means, as the common practice employs*.

THE method of placing the thigh on its side, as directed by Mr Pot, and trusting

* See Mr Northcote's *marine practice* lately published. Treating of fractures of this bone, he says, "The cure is to be attempted by the *spica bandage* and the *axis in peritrochio*, (to be got of the Instrument-makers)".

trusting the retention altogether to this posture, I am much inclined to regard—as doing little more than leaving it to nature. In oblique fractures especially the contractile *nifus* of the strong and numerous femoral muscles forbids us to expect retention from posture alone, however well contrived. Indeed, splints secured with such bandages as are formerly described, are not neglected; however, for the reasons adduced above, the additional security resulting from these is very inconsiderable. Keeping the muscles, as much as may be, relaxed by the method already recommended,—no doubt, contributes considerably towards retention; by somewhat shortening the line of their contractility,—and rendering them less apt to pull the fragments over one another, than when the leg is fully extended in the same plane with the body: yet such

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long

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long muscles are still capable of contracting much more; and always do so, as soon as the fragments lose their opposition, and the resistance to their further contraction consequently removed*.

FROM the foregoing observations, it follows,—that if retention of the fragments of the *os femoris* is at all to be effected, it must be by *mechanical means*; calculated to fulfil the purposes above enumerated, with as great safety to the parts, and ease to the patient, as possible.

By mechanical means are here understood such only as are consistent with the relaxed state of the muscles, whether

* Longe infra tertiam partem longitudinem musculi diminui adparet. *Haller prim. lin. physiolog. Sect. cccci.*

whether to obtain it the patient lie on his side or on his back ; therefore the above conclusion by no means contradicts what Mr Pot says in the following passage ; where, apprehending that such assistances were inconsistent with keeping the muscles relaxed, and resolving to confide in posture only for a perfect cure, his words are: “ If I meant to describe, or if I approved (pardon the phrase) the common method of placing the broken leg and thigh in a straight manner, this would be the place to mention the many very ingenious contrivances, and pieces of machinery, which practitioners, both antient and modern, have described for the purpose of keeping the whole limb straight and steady; that is, of keeping all the muscles surrounding the fractured bone upon the stretch, and, at the same time, of preventing any inequality in the union of it, and
any

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any shortening in consequence of that inequality; but as my intention is to inculcate another, and, as it appears to me, a better disposition of the limb, in which such boxes, cradles, and pieces of machinery are not wanted, or cannot be used,—it is needless to say any thing about them*.”

I SHALL take the liberty to make a few remarks on some of these mechanical contrivances or machines, which have been recommended to accomplish retention of the fractured *os femoris*.

THE case of a young girl, who, by a fall from a house-top, had fractured her thigh-bone, is narrated by the celebrated *F. Hildanus*†. The fracture was near the upper part of this bone,
the

* See his general remarks on fractures, p. 44

† *Hildani opera*, Cent. V. Observat 86.

the leg was considerably shortened; and, from the over-lying of the fragments, a large tumor was perceived externally at the place of the fracture. Extension, coaptation, and deligation were performed; and, for fourteen days, every thing succeeded to his wish: in the night-time, however, being pestered with flies and fleas (*muscae et pulices*), she had altered the situation of her body, by which the fragments were displaced; so that, on visiting her in the morning, he found her leg shortened, and the tumor returned. Extension, &c. were repeated, and the same accident followed: he now despaired of success, and thought it vain to make any further attempts towards a perfect cure.

WHEN in this predicament, he happily contrived a machine, (Plate I. Fig. 3.); the invention of which (with
more

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more devotion than falls, I am afraid, to the lot of many of his modern brethren) he piously ascribes to the inspiring aid of heaven: by it he effected perfect retention and cure.

THIS machine consists of an iron-plate, AA; of sufficient length to reach from the top of the *pelvis* to below the knee; properly hollowed, to receive the external part of the thigh,—and lined with soft materials: it is provided with three belts;—one BB is fixed round the *pelvis*; the other two, CC and DD, fixed round the leg,—the one above, the other below, the knee-joint.

THOUGH this machine, to retain the fractured thigh-bone, is deficient in some necessary requisites; and seems chiefly to act by pressure on the place of the fracture, and calculated for the extended posture of the leg: yet

yet it is by far more likely to effect the retention of the fragments of this bone, than any of the retentive means commonly employed,—particularly than junks. It is surprising, it has not been oftener made use of. By omitting to tie the belt, which passes below the knee,—it permits flexion of the knee-joint, with a view to relax the muscles, in which-ever of the two positions above-mentioned the leg is placed: This is an advantage not attended to by its author.

THE following passage from Doctor James's medicinal Dictionary, is not foreign to our subject. After remarking the difficulty of retaining the fragments of this bone *in situ*, he says; “ it would be worth while to invent a machine to preserve a fractured thigh in a due extension ; so that the injured limb may be kept of the
same

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same length with the other, for fourteen days or more,—or indeed, during the whole time of the cure; for then you might reasonably expect a certain and more successful conglutination. Though Hildanus has described an instrument, proper for the extension of oblique fractures; yet it is to be feared, it is something imperfect. In the mean time, since we are without a better, and the method by bandage, above described, is not thought sufficient; it will not be amiss to apply that machine of Hildanus, &c.”

THE next I shall mention, is one invented by M. Belloq, a very ingenious Surgeon of the Royal Academy of Surgery in France,—approved of by that learned and respectable body; and which M. Belloq found to succeed in two cases of oblique fracture of the *os femoris*, after he had in vain tried the

the bandaging *apparatus* commonly employed in such cases*.

M. BELLOQ calls it a *mechanical bandage*. It can only be applied when the leg is in an extended posture; therefore, according to our principles, it cannot be here recommended. Independent of this objection,—its very complex, though artful construction, will, we are afraid, prevent it from ever being adopted by the general practice.

THE very ingenious Mr Gooch, an eminent surgeon in Norwich, has invented and recommended a machine; expressly calculated to perform retention of the fragments of the *os femoris*,

N

(Plate

* For a particular description and delineation of M. Belloq's machine, see [Memoires de l'Academie royale de Chirurgie, tom. iii. p. 233. Description d'une machine pour les fractures obliques du corps du femur et celles de son col.]

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(Plate I. Fig. 2). It consists of three jointed circulars, lined with soft materials to surround the limb. The upper one AA applies to the upper part of the thigh, the other two are connected together; the one BB fixes above the knee, the other CC below it, the better to divide the pressure: they are therefore to be regarded only as one. This, and the upper one, are connected by two pillars DD, one on each side of the thigh; so contrived, that by turning the screws FF by the key E, they are elongated at pleasure, and the two circulars are farther removed from one another: or the intervening portion of the thigh in which the fracture is supposed to be, is kept extended to its natural length; and a substitution provided against the action of the muscles, in place of that which the bone in a sound state afforded. His own account of it is as follows:

“ How

“ How to keep a fractured thigh duly extended, particularly in adults, has exercised the thoughts of some of the ablest surgeons; and it is a point of great consequence to be well effected.

“ SEVERAL years ago I had a machine made for this purpose, according to a sketch I drew of it before; and soon had a fair opportunity of trying its usefulness. It answered my design the first time I used it beyond my expectation, in a very bad oblique fracture; attended with a vexatious cough, which occasioned extreme pain by shaking the limb, and deprived the patient of his rest: it kept the part, sensibly to himself, in a gentle extension, and the limb in a steady posture,—so that it was not the least affected by the cough afterwards; which before, according to his own expression, gave him

him such a sensation of pain, as if the ends of the bones were thrusting into the flesh. This machine being lined with soft oiled leather, and well stuffed with wool,—sat very easy on the part, without causing any excoriation. Pieces of buff-leather will defend the limb against the machine, as well as the other lining and stuffing,—as has been particularly tried ; but very particular caution is necessary, to guard the inside of the thigh.

“ THIS machine is very simple in its construction, and intended to maintain its power upon the limb in any posture necessary to put it or the body in ;—and I hope the repeated trials of other surgeons will farther confirm its utility, even in fractures upon the neck of this bone*.”

THE

* See his Cases and Remarks, vol. I. p. 307.

AN objection to this machine is,—that it cannot safely be brought to act with force sufficient to resist the contraction of the muscles; because of its upper circular, which being intirely fixed on the soft muscular parts of the thigh, not only the circulation in the limb in general, but that in the great vessels which run on the inside of the thigh in particular,—is in danger of being greatly impeded: and so swelling, inflammation, and perhaps gangrene of the whole leg induced; unless provided against with the greatest circumspection. The author himself indeed acknowledges, that “great caution is necessary to guard the inside of the thigh.”

THOUGH the upper circular thus embracing the thigh in its upper or middle part, where the circulation is altogether unprotected against its action,

tion, creates an objection to this machine; this cannot be said of its lower one,—which is prevented from sensibly impeding the circulation, by the ham-strings, or tendons of the flexor muscles of the leg, between which the crural vessels pass securely. The two circulars connected inflexibly together, however, render the flexion of the knee-joint, and consequently the relaxing of the muscles, impossible.

WHEN the neck of this bone is fractured, the *trochanter major* is drawn upward on the lateral and back part of the *pelvis*, considerably above the *acetabulum*, by the contracting muscles, (Plate I. Fig. 1. D). To this circumstance the shortening of the leg, always consequent to fractures here, is owing: as Mr Gooch's machine does not lay hold of the *pelvis*, but of the thigh itself; it is to be feared that, in this case,
it

it would not properly effect retention,
—although it could otherwise be used
with the greatest safety.

Explanation of PLATE I.

FIG. I.

REPRESENTS the bones of the *pelvis*, with the thigh-bones fractured in various directions.

A. B. C. TRANSVERSE and oblique fractures of the left thigh-bone; where the fragments are, notwithstanding, supposed to remain *in situ*.

O. O. THE pricked lines mark how, in the case of oblique fracture, as at B, by muscular action,—the inferior fragment is made to overlop the superior one; thus causing a shortening of the thigh.

THE

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THE right thigh-bone is supposed to be fractured in its neck.

D. THE situation the *trachanter major* may be supposed to take, in consequence of fracture of the neck of this bone.

E. THE articular extremity of this bone, still inherent in the *acētabulum*.

F. THE oblique situation of the neck of this bone, in a sound state.

FIG. 2.

REPRESENTS a machine invented by Mr Gooch, for the retention of the fragments of the thigh-bone.

A A. A JOINTED circular, which surrounds the thigh at its upper part.

BB CC.

BB. CC. Two of the same kind, connected by the rigid bars GG; the one fixes above, and the other below the knee-joint.

DD. Two wooden pillars, which pass on each side of the thigh, between the upper and lower circulars, furnished with screws at their inferior extremities ; which turned equally by the key E, must increase the distance between the circulars, and thus keep extended the intermediate portion of the included thigh.

FIG. 3.

REPRESENTS a machine; invented for the same purpose, by the celebrated Hildanus.

AA. A hollowed iron-plate, covered on the inside with soft materials;
O proportioned

proportioned in size to the thigh for which it is intended.

BB. A BROAD belt which surrounds the *pelvis*.

CC. DD. Two others of the same kind, at the inferior part of this machine; the one fixes above, and the other below the knee-joint.

FIG. 4.

REPRESENTS a paste-board splint armed, for the retention of the fractured leg-bones.

AA. THE splint, with a compress of folded linen stitched to it; perforated at its inferior extremity, for the reception of one of the ankles.

aa. TAPE straps fixed to its back part

proportioned in size to the thigh for which it is intended.

BB. A BROAD belt which surrounds the *pelvis*.

CC. DD. Two others of the same kind, at the inferior part of this machine; the one fixes above, and the other below the knee-joint.

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aa. TAPE straps fixed to its back
part

Fig. 1.

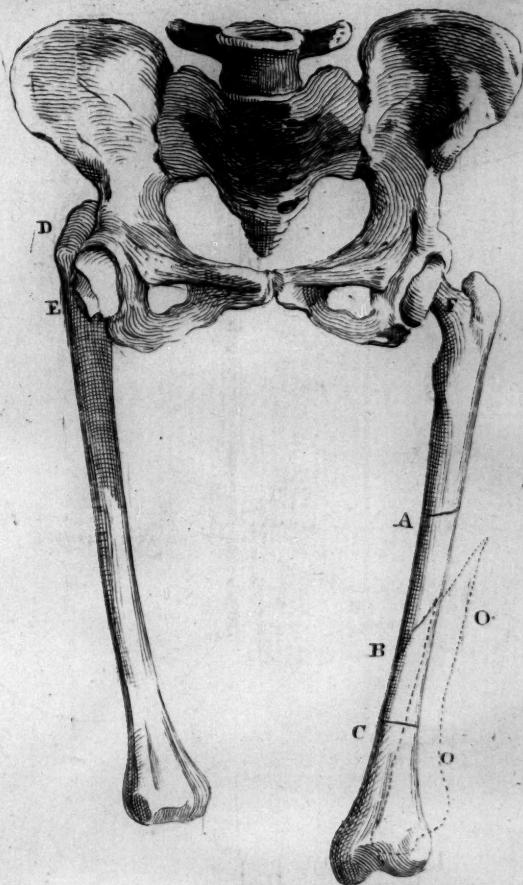


Fig. 2.

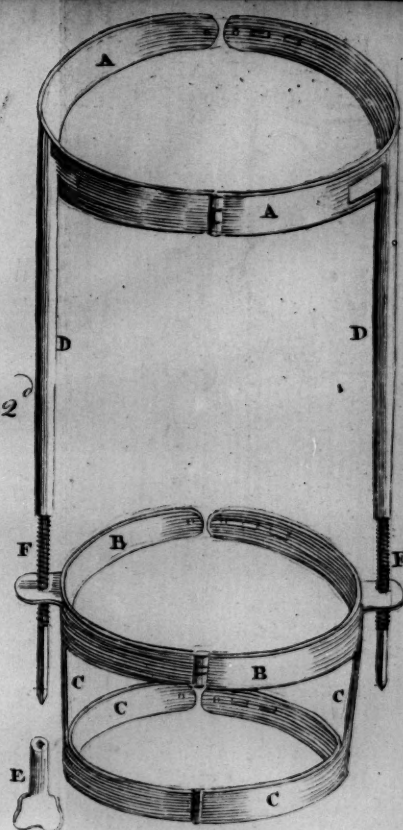


Fig. 3.

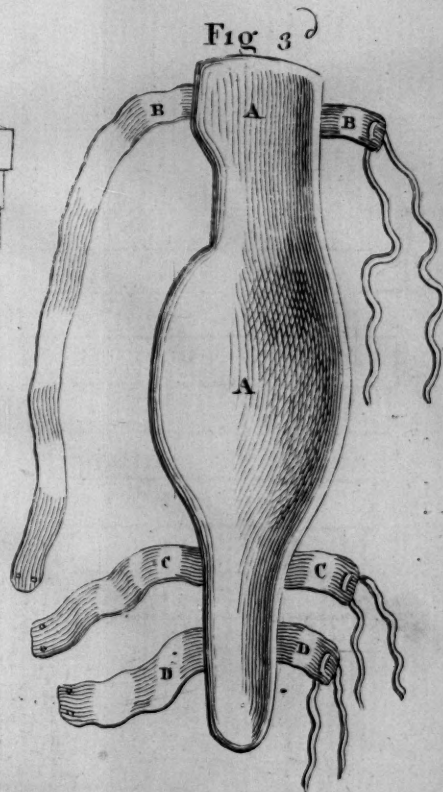
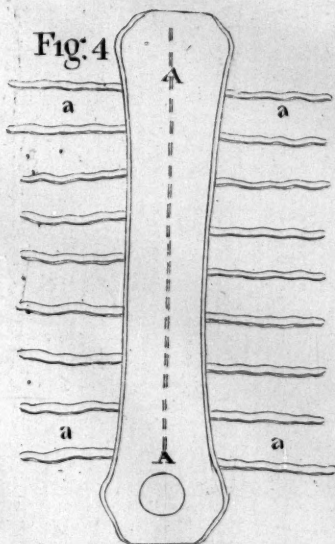
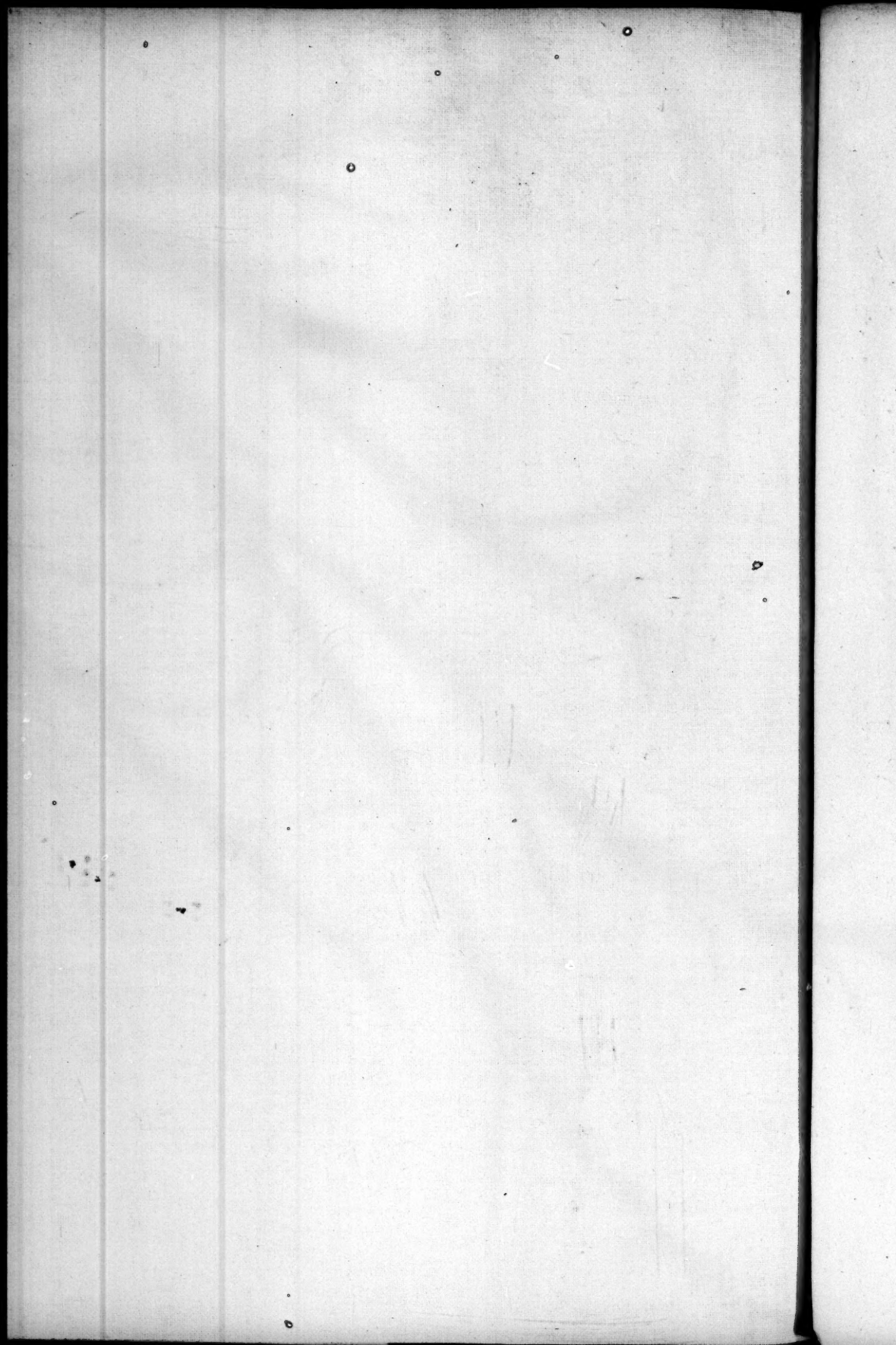


Fig. 4.





part, at small intervals; and of such length as to surround the leg, and to tie over the opposite splint.

FIG. 5.

REPRESENTS a bandage, such as is described by Scultetus and Mr William Sharp; commonly used in St Bartholomew's hospital, London, for the dressing of fractured limbs.

FOR its appearance, when applied to the leg and thigh, see Plate III.

HAVING thus (with the same candour with which I wish my own proposals may be tried) examined the several contrivances for accomplishing retention of the fractured thigh-bone, which bade fairest for success,—and found them inadequate, inconvenient,
or

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or unsafe ; with deference, I next proceed to propose and describe a machine (Plate II. Fig. 1.) for performing this important business,—against which none of the objections produced above, or any others of equal weight, as far as experience or information have yet shewn, can fairly be made : which, I fondly hope, the candid experience of my ingenious brethren—will farther improve and confirm.

It has already been observed, that a proper and necessary resistance to the constant contractile *nifus* of the femoral muscles, now that the bone is fractured, can only be supplied by assuming two fixed points,—the one above, and the other below the fractured part ; which are to be maintained at the same distance they held naturally, or immediately after extension and coaptation were duly accomplished.

The

THE *pelvis* offers itself as the most proper part for assuming the superior fixed point, because here the circulation and internal organs are protected from any pressure that may be consequent to doing so ; its situation also, as being above the neck of the thigh-bone, is an additional recommendation. For the inferior one,—the lower part of the thigh, or ordinary gartering place, for reasons already alledged, is to be chosen. About each of these a *belt* or *circular* is applied.

THE circular which embraces the *pelvis*, occupies the same place where the top-band of the breeches in men is fixed, and with much the same strictness ; and resembles it pretty much in shape : the other circular applies above the knee, with about the same tightness which the garters commonly have. These constitute the two fixed points,
and

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and are the *basis* of the resistance to the muscular contraction which we mean to produce;—their particular structure and application shall be taught hereafter.

Graduating steel-splints, three or more in number, connect these circulars in such a manner, that the intercepted portion of the thigh can be kept more or less extended at pleasure, with abundant steadiness and safety; and that even in spite of the motion which may be occasioned by convulsive startings, coughing, reaching to vomit, &c. for any length of time, and with equal facility and success, whether, to obtain the relaxed state of the muscles, the patient lie on his side or back: and, what is of the last importance, this mode of dressing a broken thigh-bone, causes as little pain or uneasiness, as well when applying as afterwards,

Of Fractures of the Thigh-bone. III

wards, as any other *apparatus* whatever, that is likely to be productive of the smallest advantage. While all this is accomplishing, the circulation is in no degree impeded or obstructed; as any one, ever so little acquainted with the anatomy of the parts concerned, must know.

PREVIOUSLY to any further explanation of what I am inclined to regard as peculiar advantages, resulting from the use of this machine for retaining the fractured thigh-bone,—it may not be improper to give such a particular description of its parts and mode of application, as may enable such as chuse properly to construct and apply it.

THE largest circular, or that which surrounds the *pelvis*, (Plate II. Fig. 1. AAA,) consists of a piece of thickish
saddle

112 *Of Fractures of the Thigh-bone.*

saddle-leather ; its breadth, when intended for an adult, may be from three to four inches : in one end of it are three or four *studs*, which have as many corresponding *holes* in the other end; by which it is buttoned or fastened round the body. These holes are continued backward, one after another, at small distances. By this simple artifice its circle can be augmented or diminished, so as to accommodate itself to *pelves* of different sizes ; or with different degrees of strictness to the same *pelvis*.

THIS circular, all except its perforated part, and about a quarter inch on each edge,—is covered on the inside with a flexible, thin iron-plate ; such as is sometimes used by tin-plate-workers : it is provided with two obscure joints at *κκ*, in that part which answers to the back ; these allow the circular
to

to open and receive the body with the greatest ease.

OVER this iron-plate, the circular is lined with the softest buff or shamoy leather; between which and the plate, a thin layer of hair or wool is interposed: the lining ought to project, on both sides over the leather half an inch or more; to prevent it in any degree from pressing on the skin. The lining is stitched all round to the edges of the leather, to which the iron-plate does not extend.

IT is most convenient, to throw the opening of this circular H to one side of the *os pubis*. After it is applied, to prevent it from moving upwards, (which the shape of the *pelvis*, and the pressure made from below hinder from happening downwards); two thick stuffed straps BB, fixed to its back part,

P

pals

pass between the thighs from behind,—to tie, by means of their forked ends *cc*, to its fore part. As almost the whole resistance to the shortening of the thigh, falls ultimately on these straps; it is of consequence that they be thick and well made: if they should notwithstanding, at any time, be found to sit uneasily,—a soft-folded cloth, or the like, can be put betwixt them and the skin.

FROM the above description, it will now be evident,—that this whole circular is constructed on the very same principle, applied and secured to the very same places, and in the very same manner, as the common *spring-rupture-bandages*. The first idea of it, indeed, was suggested, by observing with what ease and immoveable firmness, a young man I had under my care for an *hernia intestinalis*, wore one of them; during

during great exercise, and for a great length of time. The chief difference between the two is,—that this circular is much broader and thinner, and tied down to the *pelvis* by two thick straps in place of one; that it might less incommode the patient while lying on his back, and the better divide and resist the pressure from below, and act as a fixed point without proving irksome. It applies equally well, whether the body is naked,—or covered with shirt, waistcoat, breeches, &c.

THE small circular DD, or inferior fixed point, is exactly similar to the large one in structure, the tin-plate excepted; which, on account of its smaller diameter, was found to be unnecessary. As was said before, it applies round the inferior part of the thigh or gartering place, with the same, or somewhat less straitness, than that with
which

116 *Of Fractures of the Thigh-bone.*

which the garters are commonly worn: it must not, however, be so slack, as to get over the *rotula* and knee-joint. Some folds of soft flannel are, previously to the application of this circular, put round the part to which it is to be applied.

By means of three or more *graduating steel-splints* DDD, passing between these two fixed points, thus established, —to preserve them at the requisite distance from one another; the advantages derived from extension and coaptation are fully maintained, or perfect retention of the fragments is effected.

THESE splints must be sufficiently long, to extend from the upper circular to the lower one; and to project over it about a hand-breadth.—They answer very well, when made about four or five eighth parts of an inch broad ;

broad; and about one eighth part of an inch thick : that they may be rigid enough, to resist any violence tending to shorten or otherways derange the limb and fragments; and at the same time so flexible, that they can readily be bended with the hand,—and made to assume any degree of curvature in any part of them, which may be found necessary.

EACH splint has a hole or slit in its upper end,—about half an inch long, and one eighth of an inch in breadth; to receive the flat head of a stud planted in the upper circular,—in such a manner as to allow of motion round its axis, for fixing the splint.

THE inferior end of the splint passes thro' an iron-screw-plate G, which is firmly riveted to the lower circular. The screw has a flat broad head, that
it

118 *Of Fractures of the Thigh-bone.*

it may be easily turned with the fingers ; and its point fitted to catch in some one or other of the impressions purposely made in the splint at small intervals. It is easy to perceive that, by this means, the distance between the circulars can be regulated at pleasure ; and, when determined, firmly maintained.

It will now be also very apparent, that by making several such graduating splints to pass from the one circular to the other, at proper distances,—we form, as it were, a *breeches-thigh* ; *rigid* enough to oppose unsurmountable resistance to the muscular contraction, or any ordinary accident tending to alter the coaptation of the fragments ; which, notwithstanding, is at the same time *dilatable* at pleasure,—in every dimension.

As

As to the requisite number of splints, I have from experience found three answer very well. One passes from the upper circular opposite to the *os pubis*, to the inferior circular at the internal and back part of the thigh, immediately above the knee-joint: another from opposite to the anterior spine of the *os ileum*, to the fore part of the inferior circular immediately above the *rotula*: a third from above, and a little back from the *acetabulum*, to the external and back part of the thigh, immediately above the knee-joint. If more of these splints should be found or thought necessary, they can be occasionally added in the intermediate spaces. For the appearance of a thigh dressed with the ordinary pasteboard splints, Mr Sharp's bandage, and the machine now described, —see Plate III. Fig. 2.

From

120 *Of Fractures of the Thigh-bone.*

FROM the above description, where, I hope, I have expressed myself intelligibly,—it will be evident, with what security and facility this machine may be employed ; to effect retention of either thigh, or of both at the same time.

WHEN this machine is properly applied, all motion of the thigh on the *pelvis* is totally suppressed ; which will be found to be a circumstance highly favouring retention,—more especially if the fracture is in, or near the neck of the *os femoris*.

As this method of retention is effectual, independent of the assistance of any other bandaging whatever. By making the splints to arch properly outwards, the necessary applications to all the thigh, or to wounds in any part of it, may be made,—without in the least disturbing the fragments, or paining the patient. Its extensive use
in

in the treatment of compound fractures of this part, requires no farther illustration.

THE advantages that may result from the use of this machine in the management of wounds of the thigh, with loss of substance of the bone, (which may happen from various causes, particularly the different species of *caries*); will also be abundantly obvious: however, more fully to illustrate this observation, the following case is adduced, in which, if I am not much deceived, the patient would at least have reaped much ease and relief from this mode of dressing.

“ A STUDENT, of the age of twenty, for several years had an ulcer with *caries* in the middle and internal part of his thigh, where the crural artery descends: the *caries*, from the thickness

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of

of the flesh in this part of the thigh, was invisible; neither could the ulcer be enlarged with the knife, or the bone cauterized, on account of the vicinity of the great artery,—so that all the medicines that were applied proved ineffectual. At length, in walking, without any external violence, the thigh was broken in this very part. Here again, we could neither enlarge the wound, or cauterize the bone, for the reasons above mentioned; and although the bone was reduced, and a proper bandage applied,—yet it would never heal, and the patient led a miserable life. It is therefore the duty of every one to consider, how such a fracture should be treated, &c*.”

WHILE speaking of the advantages of this machine, it may be mentioned; that,

* *Doctor James's medicinal Dictionary.*

Of Fractures of the Thigh-bone. 123

that, by its use, the ordinary time of confining the patient to bed may be much abridged: for, with it applied, he may much sooner venture to rise than would otherwise be prudent.

Of

Of FRACTURES of the LEG-BONES.

THE difficulty of effecting due retention of the fragments of the leg-bones, after coaptation, is far from being so great as that of the fractured thigh-bone is shewn to be. However, if fractures here are much oblique, attended with wounds, or followed with high inflammation, supuration, &c. the retentive part of their treatment is by no means easy to be accomplished. Any considerable loss of the substance of the bones, still renders this business much more difficult. Of this last assertion, the following case will furnish an illustration.

A man,

A MAN, who, by a fall from a great height, had received a very bad compound fracture of the leg, with the *tibia* considerably protruded from the wound,—was put under the care of M. Vernier an able Surgeon. After coaptation, he found it impossible, by the ordinary bandages, to effect retention of the fragments; and gangrenous symptoms supervened in consequence. After these were mitigated by proper remedies, M. Vernier again attempted extension; but, on account of the remaining swelling, this, in due degree, was found impracticable.

ON the twentieth day from the accident, the assistance of M. Coutavos of the French Academy of Surgery (by whom this case is published among the Academy's memoirs*) was obtained. Upon careful examination, M. Coutavos

* *Memoires de la Academie Royale de la Chirurgie*,
Tom. II. p. 415.

126 *Of Fractures of the Leg-bones.*

tavos found a portion of the *tibia*, above five inches in length, almost quite detached. With the necessary precaution this was extracted, the fragments of the *fibula* were observed to pass one another above four inches; the leg was shortened in the same degree; notwithstanding the use of a machine invented and recommended for the retention of fractures, by M. la Faye; which will be hereafter mentioned.

In this situation, the patient suffered such intolerable pain, from the *stimulus* of the pointed fragments,—that M. Coutavos found it absolutely necessary to procure extension of the leg, by some means or other; which he accordingly attempted, in the following laborious manner.

LACS properly made, and passed under the patient's arms, between the thighs,

thighs, and below the knee of the fractured leg,—were fixed to the head of the bed-frame, with a view to secure his body from yielding to the extending power ; which was applied by means of another lac passed round the ancle,—which could be stretched at pleasure, by means of an axis in *peritrochio* planted at the bed-foot. By gradually increasing the extension in this manner, the limb at last regained its natural length.

AFTER the patient had remained in this racking situation for fifteen days,—M. Coutavos ingenuously confesses, that, by the strictness of the lac at the ancle, so great swelling of the foot ensued as made it absolutely necessary to diminish the extending force; in consequence of which, the leg was again shortened above an inch.

Both

128 *Of Fractures of the Leg-bones.*

BOTH by experience and probability, I am encouraged to propose a machine (Plate II. Fig. 3. and 4.) constructed on the very same principle with the one recommended above for the thigh; which bids fair to effect retention of the fractured leg-bones with the greatest possible ease and safety, where-ever it is by any means practicable.

IN this machine, the graduating splints, made rather longer than the leg from the knee downwards, to which they are to be applied,—are connected at their lower extremities, by means of flat-headed vertible studs or pins, to the sole of a shoe laced before; otherwise of the ordinary form (Fig. 4.): or with the quarter-heel protracted in the form of a half-boot (Fig. 3.), the better to embrace and lace round the ankle and inferior part of the leg.

THE

THE other extremities of the splints are fixed in the screw-plates of a circular, exactly similar to the inferior circular of the thigh-machine before delineated,—applied below the knee-joint.

THE fore splint is made forked, or with an opening at the lower extremity (Fig. 5.); of a compass sufficient to receive, but so as not, in the smallest degree, to press upon the fore part of the foot. This circumstance contributes greatly to the security of the foot against lateral motion.

THE intention of the shoe (in which ever of the two forms it may be made) in having an opening before, is,—that the foot may be lodged in it, with as little pain to the patient, or disturbance to the fragments, as possible. When this is done, the opening is to

R

be

be accurately secured with a lace. The foot is previously to be involved in a piece of soft flannel, or covered with a stocking-foot; as well for the sake of softness as warmth. At first, I made use of this machine constructed with a circular,—which fixed about the leg at the ankle, (Fig. 2.); but, from repeated trials, have found the shoe to answer better in every respect.

It will readily be understood, from the description of this machine, how effectually, by its means, the retention of all compound, as well as of simple oblique fractures of the leg, may be effected with the greatest convenience and safety;—by bending the splints a little outwards, it allows the wounds to be inspected and dressed with the greatest ease, in whatever part of the leg they may be situated;—by laying hold of the fore splint with one hand, the

the Surgeon can raise the leg, alter its situation when necessary, shift the dressings or bandages without the help of an assistant; and, what is of much greater consequence, without giving the patient the smallest degree of additional pain. It seems to me highly probable, M. Coutavos would have assisted his patient as much, or more, by this instrument, than the method he pursued.

IN all simple, and in many compound fractures,—this instrument supercedes the necessity of any other *bandage*, *soal-piece*, or *safe-guard*, to protect the limb from being incommoded by the pressure of the incumbent bed-cloaths.

ANOTHER advantage attending the use of this machine, for the retention of the fractured leg-bones, not to be passed over in silence, is,—that, by its
help

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help, the patient is in a condition to leave his bed with safety, much sooner than could otherwise be attempted. I had a young man, after a compound fracture of the leg, marching through the street with it, within four or five weeks from the accident. By it the leg may be altogether protected from the weight of the body.

THIS machine can very easily be rendered portable in the pocket by making a joint in each splint,—to allow only of side-motion; which, in no degree, impairs its retentive properties. Upon the whole, this instrument, tho' really a *stiff boot*, dilatable in every dimension,—may be regarded as a very portable, simple, and cheap *fracture-box*.

Of

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*Of transporting Patients with Fractures
of the Bones of their Thighs or Legs.*

A CONSIDERATION of the exquisite tortures which these unhappy people must suffer, who are obliged, by unavoidable necessity, to be transported, sometimes in great haste, and to a great distance, with fractures of their thighs and legs, either quite recent, or before their fragments are reunited,—in a very particular manner claims the joint succours of humanity and art.

THE gallant warrior, whether acting by sea or land, is peculiarly exposed to calamities of this kind. M. la Faye

Faye, an eminent Surgeon and member of the French Academy, who, it would appear, has been an eye-witness of the distressful scenes which this circumstance occasions,—can best paint them; I shall therefore, without farther apology, translate part of a memoir wrote by him expressly on this subject.

“ Of all men, who stand in need of the aids of surgery,—none deserve it more than those who continually expose their lives in defence of the state.

“ No spectacle can be more affecting, than the transportation of a number
ber

* De tous les hommes qui ont besoin des secours de la Chirurgie, il n'en est point qui méritent plus notre attention & nos soins, que ceux qui exposent continuellement leur vie pour la défense de l'Etat.

C'est un spectacle touchant que celui d'une multitude d'Officiers & de Soldats dangereusement blessés, qu'on transporte

ber of wounded officers and soldiers from the trench or field of battle to a place for dressing them: I have always, in such conjunctures, been much touched with the terrible pains and accidents which the very motion of the persons employed to place the wounded in proper carriages, and of the carriages themselves, occasion to such as have the bones of their legs or thighs shattered.

“ It is difficult to move, and place in a carriage, people in this situation, without disturbing the wounded parts; but, although this should be accomplished, it is impossible that they can be driven

transporte de la tranchée ou du champ de bataille au lieu où l'on doit les panser; j'ai toujours été touché dans de telles conjonctures, des douleurs affreuses, & des accidens que le mouvement des personnes qui mettent les blessés dans les chariots, & celui de ces voitures mêmes, occasionnent à ceux qui ont la jambe ou la cuisse fracassée.

Il est difficile de porter & de mettre dans une voiture, un malade qui sera dans ce cas, sans mouvoir la partie blessée;

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driven for some leagues, or even half a league, without suffering the most acute pains from the shocks, which, in spite of all the bandaging about the fractures, at every movement, must displace the fragments, and make them grate on one another,—thus irritating parts extremely sensible and delicate. If the pains occasioned by the transporting are lively, the consequences are not less troublesome.

“ The splintered fragments, pricking and tearing the muscles, nerves, &c. already

bleffée; mais quand on le porteroit & qu'on le mettroit dans la voiture sans causer aucune secousse au membre, il est impossible que la voiture qui transporte le malade à quelques lieues, même à une demi-lieue, ne lui cause des douleurs très-aiguës par des secouffes, qui, malgré tout l'appareil mis sur la fracture, déplacent à chaque instant les pièces osseuses, & les font frotter les unes contre les autres, en irritant des parties extrêmement délicates & sensibles. Si les douleurs causées par le transport sont vives, les suites en sont tout aussi fâcheuses.

Les pièces osseuses brisées, en piquant & en déchirant les muscles, les tendons, les nerfs, les parties aponévrotiques,

already wounded, augment the swelling, inflammation and effusions; and often occasion mortification and gangrene in consequence, which perhaps would not else have happened. These accidents are ordinarily followed with fever, delirium, convulsive startings; in one word, with general disorder of the whole animal œconomy. Besides this, the fragments may be so much displaced as to tear some considerable vessel, and cause an hæmorrhage not to be remedied but by immediate amputation of the member; or, if not discovered in time, the hæmorrhage may prove mortal.

S

“ People

vrotiques, déjà blessées, augmentent le gonflement, l'inflammation & les dépôts; & par conséquent occasionnent souvent la mortification & la gangrène, qui peut être ne seroient pas survenues. Ces accidens sont ordinairement suivis de fièvre, de délire, de mouvemens convulsifs, en un mot, d'un désordre général de toute l'œconomie animale: de plus les pièces osseuses peuvent en se déplaçant ouvrir quelque vaisseau considérable, & causer une hémorragie à laquelle

“ PEOPLE wounded in war, after having undergone the pains and dangers of a first transporting, are almost always exposed to new pains and fresh dangers, greater than the first, on account of the changing their situation; because of their number, or for other reasons of which the detail is unnecessary. I say, the dangers, to which a second transporting exposes them, are greater than the first; because the sick, having already suffered abundantly,

laquelle on ne puisse remédier que par une prompte amputation du membre, ou une hémorragie mortelle; parce qu'on s'en sera aperçu trop tard.

Les personnes blessées à la guerre, après avoir souffert les douleurs & essuyé les dangers d'un premier transport, sont presque toujours exposées à de nouvelles douleurs & à de nouveaux dangers plus grands que les premiers, par la nécessité de les changer de lieu; soit à cause de leur multitude, soit pour d'autres raisons dont le détail pas nécessaire. Je dis que ces dangers auxquels un second transport les expose sont plus grands que les premiers, parce que les malades ayant déjà beaucoup souffert, sont moins en état de supporter une nouvelle fatigue: & que d'ailleurs,

le

ly, are less in condition to support fresh fatigue : and beside, the motion of the carriage, in spite of all the precaution taken in such cases, may not only cause all the mischiefs which I have already enumerated when speaking of the first transporting ; but may also, by the derangement of the fragments, and the irritation of the sensible parts, disturb the suppuration already established, or about to be so,—and thus occasion a retrocession of the purulent matter ; a circumstance which is known ordinarily to prove fatal.

“ The

le mouvement de la voiture peut, malgré toutes les précautions qu'on prend en ces cas, leur causer non seulement les accidens dont nous avons fait le détail au sujet du premier transport ; mais encore troubler, par le dérangement des pièces & par l'irritation des parties aponévrotiques, la suppuration déjà établie, ou qui commence à s'établir,—& occasionner le reflux de matiere purulente ; reflux qu'on sçait être ordinairement mortel.

L'intérêt

“ THE concern which one ought to take for the solace and preservation of people wounded, while generously exposing their life for the state,—has excited me, in a particular manner, to investigate means to prevent all these inconveniences. I am instigated with the greater ardour in this pursuit, since my labours, at the same time that they are useful to the warrior,—cannot fail, in like manner, to prove so to other classes of mankind, who follow perilous professions and exercises; such as, masons,

L'intérêt qu'on doit prendre au soulagement, & à la conservation d'un grand nombre de personnes blessées en prodiguant généreusement leur vie pour l'Etat, m'a engagé à m'appliquer d'une manière particulière aux moyens de prévenir tous ces inconvénients. Je me suis porté à cette recherche avec d'autant plus d'ardeur, que mon travail ne pouvoit être utile aux gens de guerre, sans l'être aussi aux personnes qu'une profession périlleuse, telle que celle de Maçon, de Couvreur, de Plombier; que certains exercices, comme par exemple, la chasse; ou qu'un malheureux hazard, peuvent mettre dans le cas d'avoir besoin des mêmes secours.

maçons, flaters, plumbers, lovers of the chace, &c. &c.”

M. LA FAYE then goes on to describe a machine, which he recommends for the purpose of facilitating the transport of people in this unhappy situation. Without depretiating the invention of M. la Faye, I proceed to observe,—that the thigh and leg-machines, above described, will also very well answer the same purpose. They both can be applied without stripping the patient; and, when properly applied, very perfectly secure the parts against the smallest degree of alteration, even from the movement of a carriage.

IN ships of war, fractures of the limbs are no uncommon accidents: the difficulties of effecting retention of the fragments, while the patients remain

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main on ship-board, but more especially when it is found necessary to convey such patients from one ship to another, or to hospitals a-shore,—must be fully greater than these which result from similar accidents on land. Contrivances, such as are mentioned above, are here likely to perform the most important services.

MR WATHEN, an ingenious Surgeon, has described a machine, which he calls a *Conductor*; purposely invented to retain fractures of the leg-bones, where it is found necessary to transport the patient*. The leg-machine above mentioned is much less cumbersome than the *Conductor*, and perhaps gives greater security.

Of

* See his treatise, intitled the *Conductor* and containing splints.

extended pattern: 10 as the name

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are to be brought and kept in it.

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extended posture ; so as that the parts of the divided tendon may be kept in exact opposition and contiguous, (in the same manner as the fragments of the bones,) till they are re-united*.

THE same method of cure is to be prosecuted, for partial divisions of this tendon; and for deep transverse wounds of the *gastrocnemii* muscles, whether immediately at, or near where they become tendinous.

VARIOUS methods of maintaining the extended posture of the foot have been recommended by authors. Mr Gooch advises the following one:

“ The ends of the divided tendon are to be brought and kept as near together

* The method of preserving them in contact by suture, seems now to be universally discarded.

gether as possible, by a favourable posture of the limb; which is effected by bending the knee and heel, and extending the foot to such a degree as is easy to the patient; keeping it so after dressing the wound by the following bandage,—first equalizing the small of the leg, with soft well adapted compresses of linen cloth, fine tow, or quilting cotton, the latter of which is preferable to the others.”

“ BEGIN the bandage, by making a few circular turns of a roller of a sufficient length and breadth about the thigh, just above the knee,—passing it round below, two or three times, in a figure of 8; descending then in regular and small edgings, that it may be even and easy down to the ancle; making then a few turns, as about the knee, proceeding spirally to the toes : when, after making a few circulars,

T the

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the roller is to be fastened with a needle and thread, reflecting it from thence upon the sole of the foot, up the back part of the leg, to the circulars above the knee; sewing it well there, and in the whole course of it, with a needle and thread; taking particular care, all the while, to have the leg kept in its true favourable posture, by proper Assistants;—and, when this is done, it is necessary to have it rested upon a pillow in bed, strictly injoining the patient's own care to keep the limb quiet. The application of this bandage may be begun upon the foot at the toes; leaving a portion of the roller then to be reflected, fixed, and secured, as before described*.”

ALTHOUGH there should be no attending wound, this method by the roller-bandage must be exceedingly troublesome

* See his cases and remarks, Vol. II. p. 193.

troublesome and laborious; but where there is a wound, it must prove much more so;—besides, the extension of the foot cannot be graduated without undoing almost the whole roller.

THE celebrated M. Petit invented the following method, by which the extension can be regulated at pleasure.

A SANDAL or shoe, with a low quarter-heel, is put upon the foot; from its back part a strong strap passes up the leg to the back part or hollow of the knee-joint, where a small *axis in peritrochio* is placed, and secured by means of a broad circular,—so divided in its fore part, that the one half passes above, and the other below the knee. By turning the *axis*, which is provided with a handle, the strap from the heel can be shortened or relaxed at pleasure,

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sure, and consequently the foot proportionally extended. If there is a wound, nothing impedes the necessary dressing*.

A METHOD almost similar, though more simple, was practised in his own case by the late Professor Dr Monro.—He made use of a foot-sock, or slipper of tiking; open at the toes, to prevent them from being squeezed, when the extension was made by a strap; which went from the back part of the sock to fix above the calf, to a circular or calf-piece which surrounded the leg here, and laced before by means of pye-holes. The strap was graduated by the help of a buckle, in place of the *axis in peritrochio* of M. Petit. He wore this dressing for fifteen days, without moving

* See Discourse preliminaire sur la traité des maladies des os. Tom. I. p. 20.

moving the foot. To prevent too great extension of the foot,—at the end of six weeks, when he was obliged to go abroad, he wore a shoe with a very high heel. For greater security still, for five months more, he had a piece of steel, which reached from the broad of the foot to the fore part of the leg; at both ends, this steel-machine was flat and stuffed, to give as little uneasiness as possible: it was secured by ribbands. A most complete cure was the reward of all this caution and ingenuity*.

WHEN the fore-splint of the leg-machine is removed (Plate II. Fig. 4), the foot is very readily made to assume the extended situation represented by the pricked line; and as readily maintains that situation, if a straight splint is

* See Edinburgh essays and observations, physical and literary. Vol. I. Article xxi.

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is made to pass from the circular to the point of the shoe. By means of the screw-nail in the plate of the circular,—it may easily be comprehended, how accurately the quantity of the extension of the foot may be graduated; and, when determined, maintained.

UPON the supposition that the *Tendo Achillis* is fractured, this machine offers itself as a mode of dressing well adapted to its cure; second to none, as far as I know,—in simplicity, safety, security and ease. By it, the time of confinement may be much abridged; in a very short time, the patient may venture abroad with the greatest safety,—in a carriage, on horseback, or with crutches; by it, the toes are in no danger of being squeezed or crushed. Wounds attending fractures or partial divisions of this tendon, or wounds of its muscles near its commencement,—
can

can be dressed with the greatest freedom.

If the quarter-leather of the shoe is thought so high as to be in danger of disturbing the position of the tendinous fragments, it may be occasionally cut lower.

EXPLANATION of PLATE II.

FIG. I.

REPRESENTS a machine for keeping the fragments of the thigh-bone *in situ*, after setting; whether the fracture is simple or compound, in the neck or body of this bone.

AAA. THE upper circular constructed as already described, which applies round the *pelvis*, like the top-band of a pair of breeches; it rests on the same parts, and is fixed or buttoned in the
the

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the same manner, by the studs and corresponding holes H.

BB. Two soft stuffed straps fixed to the back part of this circular; of such length, as to pass betwixt the thighs from behind forward,—to tie round the fore part of the same circular, by means of their forked extremities, cc; these effectually secure the circular from moving upward.—There are two obscure joints, κκ, in the back part of this circular, to facilitate its application;—however, it applies readily enough without them.

DD. THE lower circular, which fixes above the knee at the gartering place.

EEE. THREE graduating steel-splints, which extend from the one circular to the other. Their upper

per extremities are fixed to the upper circular, by vertible flat-headed studs similar to those at FF; their lower extremities pass through the iron screw-plates GG, firmly riveted to the lower circular: the splints are provided with a number of impressions or holes, in which the screw-nails, which pass thro' the plates, catch.—By pushing the splints from below upward, the distance between the circulars is increased, by turning the screw-nails it is maintained; and consequently, the intercepted part of the included thigh can be kept extended at pleasure.—The splints are here fixed for the right thigh; the pricked lines on the other side shew, how they may be accommodated for the left one, or for both at the same time.

U

FIG.

FIG. 2.

REPRESENTS a machine constructed on the same principle with Fig. 1. for effecting the retention of the fractured leg-bones.

AA. A circular which applies below the knee-joint.

DD. ANOTHER which fixes at the ancles.

EEE. THE graduating splints; similar to those of the thigh-machine, both in construction and action.

FIG. 3. and 4.

REPRESENT the same machine; only the lower circular is exchanged for a half-boot or shoe of the ordinary form

Fig 1st

PLATE II

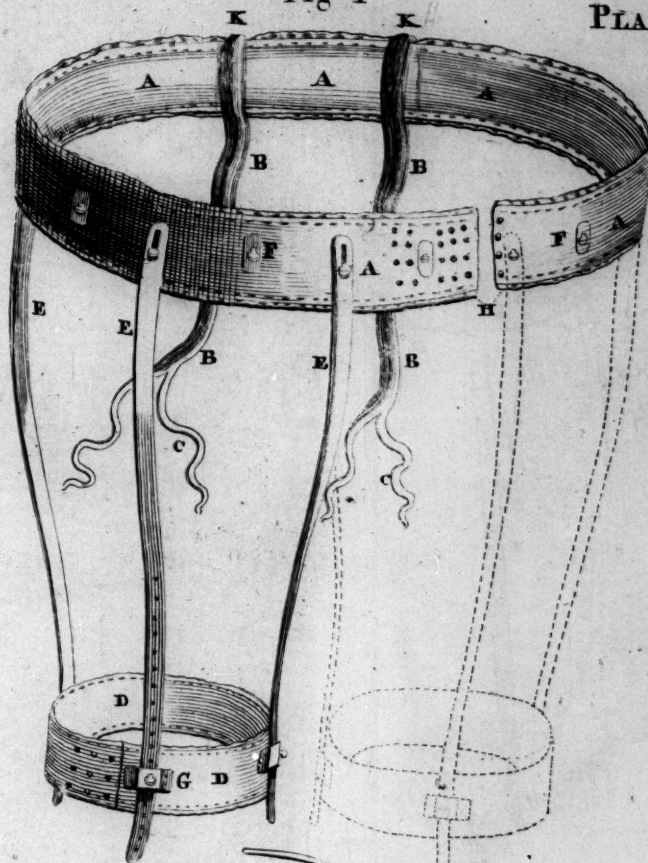


Fig. 2

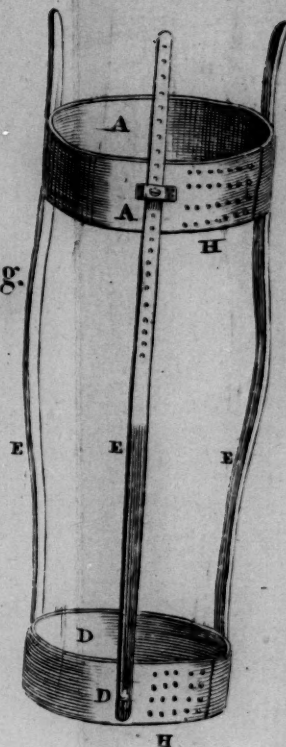


Fig 5

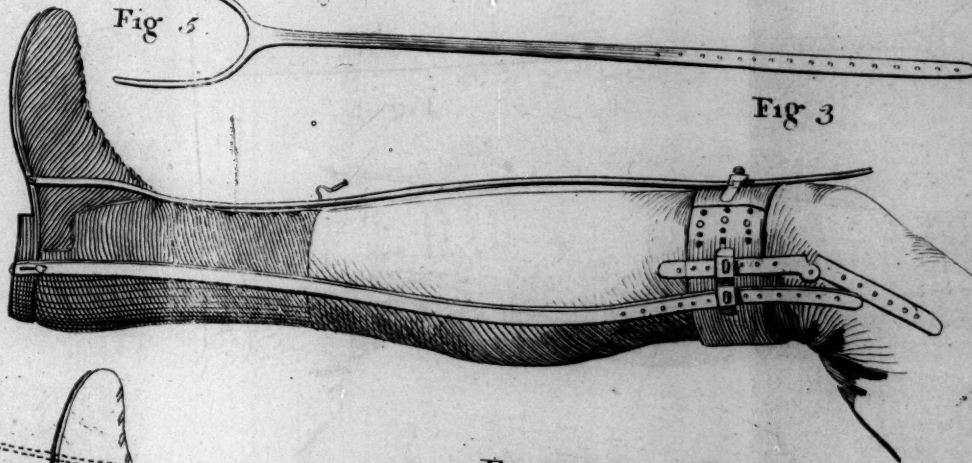
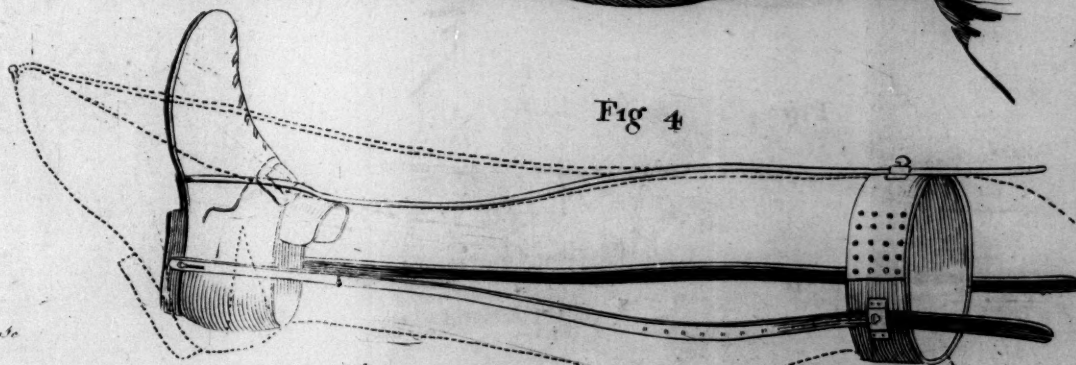
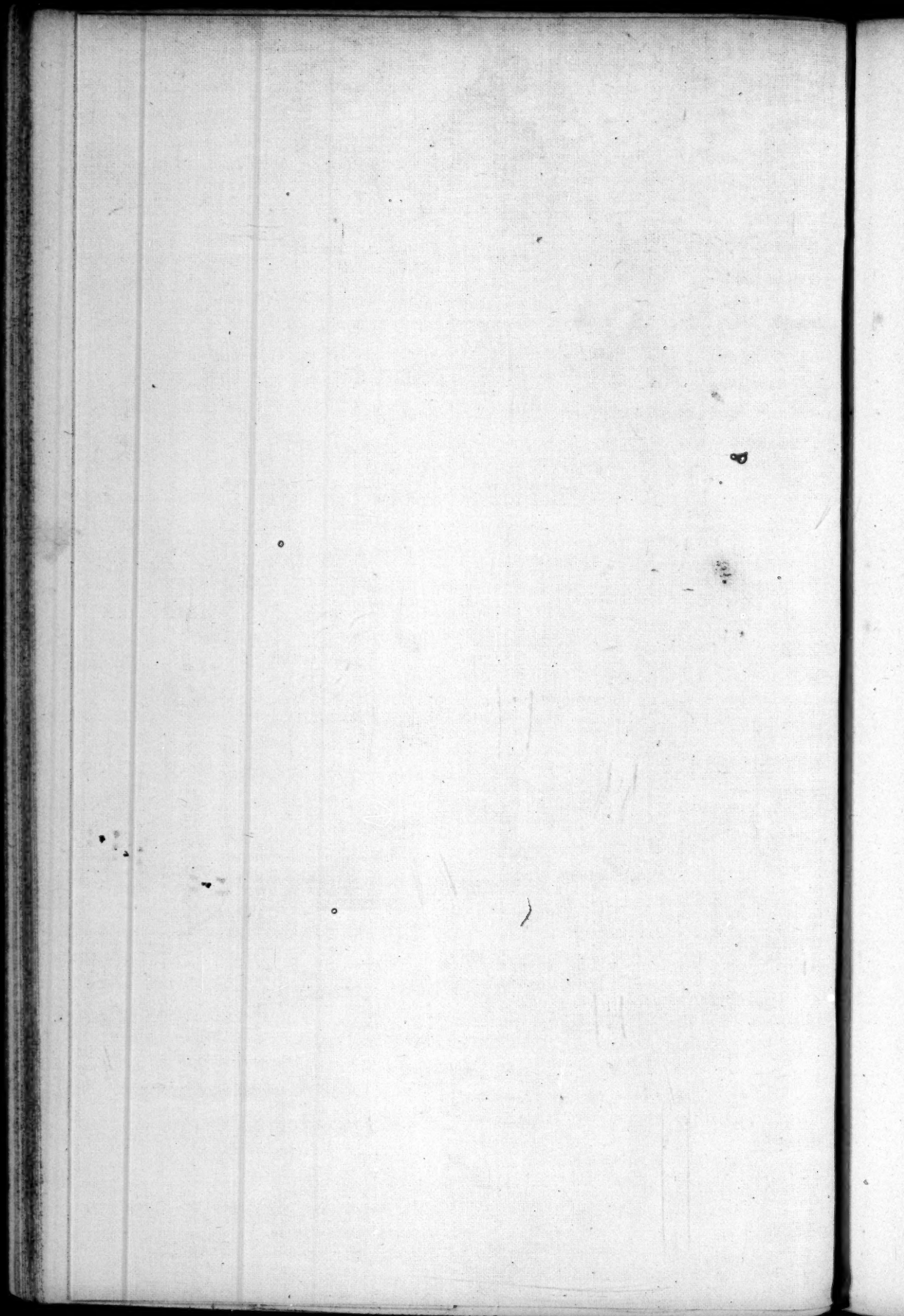


Fig 3

Fig 4





form: they are open before, the more easily to receive the foot,—then to be secured with a lace. The side-splints fix to the heel of the boot or shoe, by vertible studs; the fore-splint is forked at its inferior extremity, as in Fig. 5. by which means it includes the foot, but so as not to press upon it; it is fixed by similar studs, to the middle part of the sole.

THE circular in Fig. 3. is provided with a jointed splint; to connect it, when necessary, to the thigh-machine.

THE pricked lines in Fig. 4. shew the manner in which this machine is accommodated to the cure of the fractured *Tendo Achillis*: in this case, the fore-splint is not forked but straight; it is fixed to the point of the shoe, by which

which means the foot is securely and safely kept, in any requisite degree of extension.

Explanation of PLATE III.

FIG. 1.

REPRESENTS the leg supposed to be fractured, dressed with the leg-machine above the paste-board splints, and Mr Sharp's bandage; and elevated above the level of the body, for relaxing the muscles.

FIG. 2.

REPRESENTS the thigh supposed to be fractured, dressed in the same manner as the leg:—by doubling up the matras, the body is raised above the general surface of the bed; by which means the knee can be bended to relax the muscles.

of

PLATE 3

Fig. 1

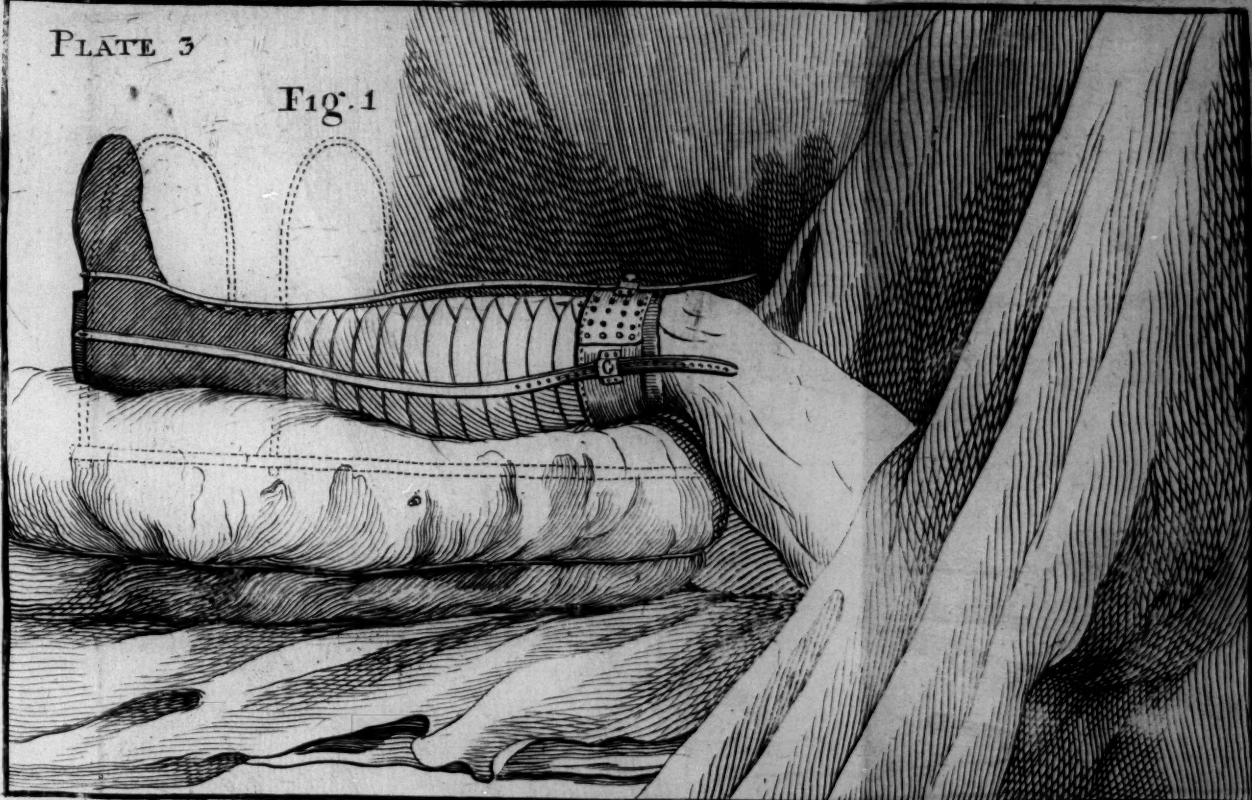
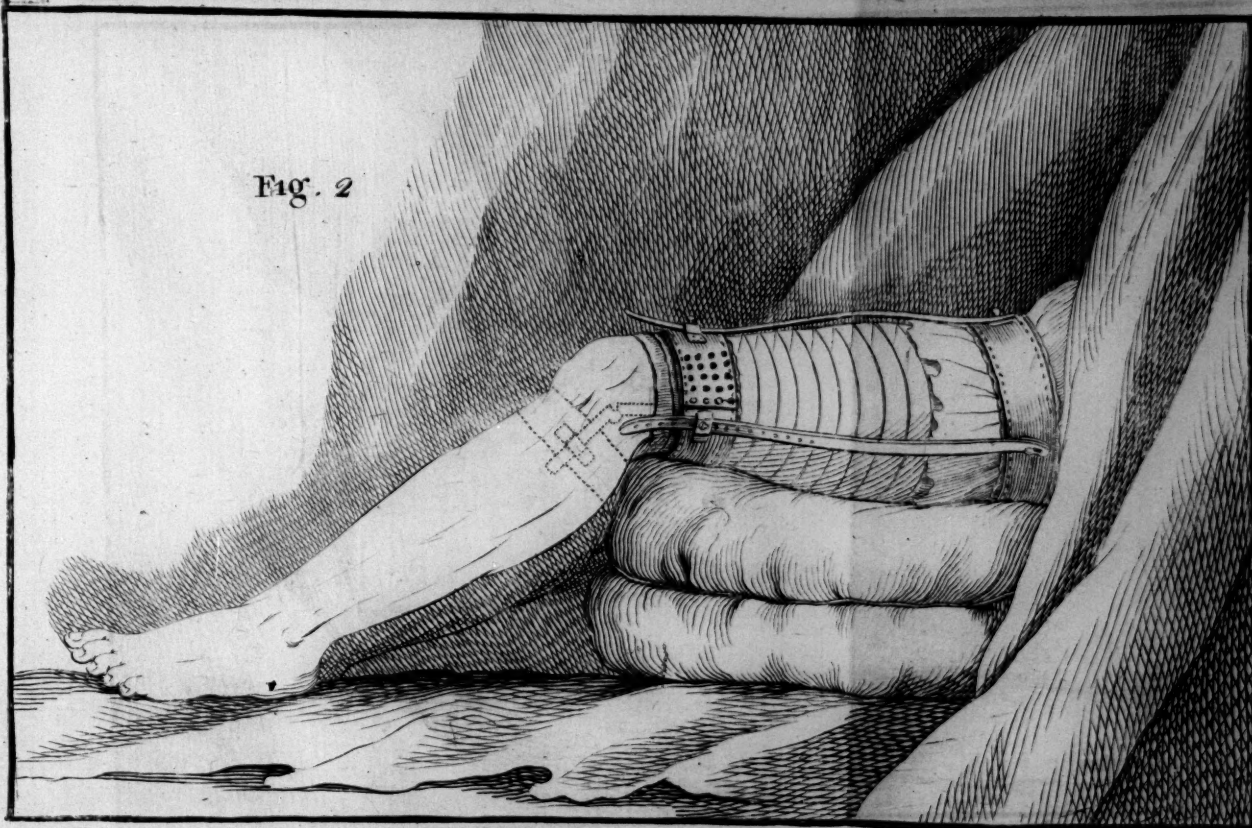


Fig. 2



158
of Retraction of the Skin, &c.
to describe a passage from an an-

till and his position, the greatest in-
the and honour.

Of RETRACTION of the Skin and mus-
cular Parts, after Amputation of the
lower Extremities.

RETRACTION of the skin and mus-
cular parts, or rather its very
troublesome consequences after ampu-
tation of the inferior extremities, par-
ticularly when instituted in the thigh,
—has (notwithstanding the double
incision) been much complained of by
surgeons of the greatest abilities and
experience; and various methods of
redress and prevention have been pro-
posed.

1. *The Cross-Stitch.*—To place this
matter in a proper light, I leave

to

to transcribe a passage from an author*, whose writings reflect on himself, and his profession, the greatest lustre and honour.

“ It must be confessed, however, that notwithstanding we derive such benefits from the double incision; the contractile disposition of the muscles, and perhaps of the skin itself, is so great, that in spite of any bandage they will retire from the bone, especially in the thigh,—and sometime render the cure tedious.

“ To remove this difficulty, I have lately, on some occasions, made use of the cross-stitch; which I would advise to be applied in the following manner, in amputations of the thigh.

“ Take a seton-needle, and thread it

* Mr S. Sharp's Critical Inquiry, p. 266.

it with about eight threads of coarse silk; so that, when they are doubled, the ligature will consist of sixteen threads, about twelve or fourteen inches long: wax it pretty much, and range the threads, so that the ligature may be flat, resembling a piece of tape; after which, oil both it and the edge of the needle: the flatness of the ligature will prevent its wearing thro' the skin so fast as it would do if it was round, and the oil will facilitate its passage: then carry the needle through the skin, at about three quarters of an inch from the edge of the stump, and out again on the inside at about half an inch from the edge of it; after which it must be passed through the opposite side of the stump from within outward, exactly at the same distance from the lips of the wound; this done, the silk is to be tied in a bow-knot. With another needle and thread of silk, the same process is

to

to be repeated; in such manner, that the ligatures may cut each other at right angles. If it is a large thigh, the lips of the wound may be made to approach each other so near, as that the diameter of the wound may be about two or three inches long;—but in this, as in all other wounds, the approximation of the lips will depend upon the laxness of the skin, and the quantity preserved by an artful double incision;—for the skin must not be drawn together so tight as to put it upon the stretch, lest it should bring on an inflammation and pain,

“ THE manner of applying the cross-stitch, after an amputation of the leg, has nothing particular in it; only that the threads must be carried between the *tibia* and *fibula*, rather than directly cover the *tibia*;—and before the skin is drawn over the end of the stump,

stump, it will be proper to lay a thick dofil of lint on the edges of the *tibia*, in order to prevent them from wounding the skin.

“ I HAVE advised the skains of silk to be tied with a bow-knot,—that in case of a hæmorrhage they may be undone, in order to discover the vessel more easily; and also if any tension should ensue, that they might be loosened for three or four days,—and tied again when the suppuration comes on, and the parts are more at liberty.

“ PERHAPS it may be objected, that the double incision is of itself sufficient for answering the ends proposed by this measure: but whoever is conversant in this branch of practice must know, that notwithstanding the lax state of the skin and muscles, at the time of the operation,—yet some days

after they fall considerably back from the bone, and in the thigh particularly; so much that no bandage will sustain them. The consequence of which is a proportionable largeness of wound, a tediousness of cure, and some degree of pointedness in the stump. It may be observed too, that the strictness of bandage for supporting the skin and muscles of the thigh, is not only painful,—but in all probability may obstruct the cure of the wound, by interrupting the nutrition; for it is certain, that by long continuance it often wastes the stump: and I am jealous it may also be necessary to those abscesses, which sometime form among the muscles in different parts of the thigh.

“ THE question then remaining is, Whether these stitches will support the skin and muscles more effectually than bandage, without producing some new evil

evil; a point which can only be decided by experiment? It is true, that this very method was followed by some of our ancestors;—and the objections to it have absolutely prevailed over the arguments in favour of it. I cannot help imagining, that caprice may have had more share in utterly discarding this method, than reason and observation;—for it is particularly said by some of the most able and candid practitioners, to have succeeded miraculously: and as the inflammation and symptomatic fever excited by it, were always relievable by cutting or loosening the stitches,—there does not seem to have been reasonable grounds for wholly giving up such great advantages.

“ But if the objections to it were of force, when the single incision was practised; they diminish exceedingly, now that we perform the operation by the double

double incision. For though the double incision does not directly prevent the withdrawing of the muscles from the bone, it abates the degree of it so much,—that they can suffer the stitches without incurring either inflammation or pain; to which they are much more liable after the single incision. It must be remarked, however, that they draw with that strength as to make the stitches wear through the skin and flesh in twelve or fourteen days; but this is done so gradually, that it causes very little pain or inflammation: and though they consequently come off with the dressings, yet by this time the skin and muscles are fixed; and a slight bandage will be sufficient to maintain them in the same position.

“ I CONFESS, however, that these stitches are an additional pain to the operation, though,—perhaps, not so bad

bad as one is apt at first to suggest ; for the mere passing a large seton needle through the flesh, without making a stricture, is very bearable in comparison of a tight ligature : but, whatever be the increase of the pain for the present, the future ease in consequence of it is an ample compensation : therefore, if I am not mistaken, there is still another consideration, of much higher importance than any I have mentioned ; and that is, a less hazard of life.

“ For the symptomatic fever, and the great danger of life attendant upon an amputation,—does not seem to proceed purely by the violence done to nature, by the pain of the operation, and the removal of the limb ; but also, from the difficulty with which large suppurations are produced : and this is evident from what we see in very large wounds, that are so circumstan-
ced

ced as to admit of healing by inosculation, or, as Surgeons express it, by the first intention: for in this case we perceive the cure to be effected without any great commotion; whereas the same wound, had it been left to suppurate, would have occasioned a symptomatic fever, &c. But, in both cases, the violence done to nature is the same; whether the wound be sewed up, or left to digest.

“UPON this principle we may account for the diminution of danger, by following the method here proposed: because, as the stitches have a power of holding up the flesh and skin over the extremity of the stump, till they adhere to each other in that situation; they actually do, by this means, lessen the surface of the wound, and, in consequence, the suppuration,—
and,

and, in consequence of both, the danger resulting from the suppuration.

“PERHAPS, it may not readily be understood, how a wound can, by any management, be suddenly so much diminished: but it may be better conceived, if we reflect on the manner in which a wound heals. For, in this way we accomplish immediately by art, what requires a length of time to be effected in the ordinary methods of nature; and with this advantageous circumstance, that when the wound is reduced into so small a compass, the skin is in a looser state than when it has not been kept forward by the stitches; in consequence of which, the cure will be more quickly compleated: for the looser the circumjacent skin is, the less will be the cicatrix; and cicatrification is by much the slowest process in healing. It appears then, from the representation

representation I have given,—that, by this method, we not only bring the wound to a small compass in a less time; but also give it a stronger tendency to heal intirely.”

THERE is some reason to suspect, that the cross-stitches not only give additional pain; but that some portion of the purulent matter, which necessarily adheres to them, will contract a degree of acrimony: and remaining on the very sensible muscular surface of the stump, as a *stimulus*,—may increase both the retraction of the skin and muscles, and the discharge.

THE ordinary method of dressing stumps is the best calculated, which can possibly be imagined, very much to assist and increase the natural retraction of the skin and muscles. I here chiefly allude to the pernicious custom

custom of using cross-compresses ; and to the still more pernicious practice of making numberless turns over them, with long unmanageable roller-bandages. Both these act principally against the retracting, yielding and unsupported circumference of the stump ; and forcibly induce the pyramidal form, which it is the operator's business, by every means, to prevent.

WITH a view to remedy, as much as possible, these inconveniencies, and to fulfil the intention of the cross-stitches,—it is proposed, immediately after amputation, suppose in the thigh, to apply round it, either equal with, or a very little higher than the termination of the skin, a properly shaped piece of strong linen, leather, or the like, spread with adhesive plaister; extending from this termination upwards upon the thigh five, six, or se-

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ven

ven inches, according to the size of the patient, (Plate IV. Fig. I. AA.) To the inferior edge of this plaister, which corresponds with the termination of the skin, straps of strong tape are to be sewed at proper intervals, (Fig. 3.)

THE thigh-machine (whose upper circular may be fixed about the *pelvis* previous to the operation) is to be applied in the same way as already taught: the lower circular, when intended for this purpose, should be about six or seven inches broad, (Fig. I. BB.) ; that it may project over the skin and muscles about three or four inches, while, at the same time, it gently supports them. To prevent the *pus* from penetrating, it must be covered with wax-cloth. The tape-straps, which are supposed to be included within the circular, are severally to be drawn

drawn, till the skin is brought to its natural tone as nearly as can be ascertained; they are then to be reflected from within outwards over the projecting edge of the circular, and securely pinned to the wax-cloth, (Fig. 1. c.). The dressing is finished, by simply covering the included surface of the stump with lint, &c.

THAT very considerable resistance will be made to the retraction by this method of dressing, is demonstrable by the following experiment. A slip of linen, an inch and half broad, and six inches long, spread with the adhæfive plaister of the shops,—was applied longitudinally to the thigh; it adhered with force sufficient to suspend, by its inferior extremity, a weight of above six pounds: one of seven pounds made it yield and glide along.

When

WHEN a stump is dressed in the way now recommended, it is confined to the same level with the body, and cannot be raised up at the will of the patient ; which, though a common, seems to be a very mischevious practice,—conducting greatly to increase the retraction, by throwing many of the muscles into action.

THIS method of dressing stumps applies with equal facility,—whether amputation is performed below the knee at the ordinary place, or above the ankle-joint. In the former case, the circular of the leg-machine (made of proper breadth and covered with wax-cloth) is to be connected, by means of two jointed splints (Plate IV. Fig. 1. EE, Fig. 2. 6. 7.), to the inferior circular of the thigh-machine ; in the latter case, the leg-machine constructed as in Plate II. Fig. 2. is to be used ;
the

the other parts of the dressing are the same as shewn above.

MORE effectually to bring the skin over the surface of the stump, as intended by the cross-stitches ; the straps of the plaister, in place of being reflected over the edge of the circular, (as in Fig. I. c.),—by means of a piece of iron shaped as in Fig. 5. applied over the opening of the circular, they may be made to converge, as it were, into a point or *focus* in a line passing thro' and parallel with the *axis* of the stump; and there tied so as to make the resistance wanted.

By this method of preventing retraction, or the falling back of the soft parts from the bone,—is by no means understood, that the skin is to be forcibly stretched beyond the natural degree of its tension; to preserve this
degree

degree of tension is all that is aimed at. As Mr Sharp alledges, that the skin and muscles are so fixed in about fourteen days from the operation, as to be in no danger of suffering further retraction,—the most simple dressings may then be substituted.

2. *Preserving flaps of the skin and flesh, or what is called the flap-operation.*—The flap-method of amputation was proposed by an English Surgeon named Lowdham; also by Sabourin and Verduin, Surgeons of great eminence,—the former of Geneva, the latter of Amsterdam. Improvements have since been added, at different times, by Messrs Ravaton, Vermale, la Faye, o'Halloran.

A MACHINE, to effect compression of the flaps better than was done by the *Soutien* of Verduin, is described and recommended

recommended by M. la Faye*. It will now be readily understood, from what is said above, how the flaps may be sustained over the stump in the most perfect and equable manner possible, at the same time, and by the same means proposed for preventing the receding of the skin and muscles after amputation in the common way;—only with this difference, that after the straps are reflected and pinned, and the flaps disposed in the most proper manner, a quantity of soft lint is to be superimposed,—sufficient to fill the opening of the circular, so as to equal its brim: the dressing is finished by accurately applying a thin piece of wood, (with a strap or two fixed to its back part), so shaped as to cover the mouth or opening of the circular, (Fig. 4.); by its straps it is to be secured to the graduating splints. By increasing or diminishing

* *Memoires del Academie Royale de Chirurgie*,
Tom. II. p. 243.

nishing the quantity of lint, or tightness of the straps by which the piece of wood is tied, it is evident,—that any degree of the most equable compression may be obtained.

ALTHOUGH the complex structure of the machine recommended by M. la Faye will, with many, be a sufficient reason for not employing it: supposing it equally simple in its parts with the one proposed above, yet it must yield to it, in so far, that while, on the one hand, by this last, a pressure of the most equable kind is made upon the flaps,—on the other hand, the retraction of the skin and muscles is opposed by a very considerable force; and much greater security against hæmorrhage, at the same time, is obtained; as will be shewn hereafter. Any one, who may take the trouble of comparing the two methods, will easily perceive the truth of this assertion.

Of

Of restraining Hemorrhage, after Amputation of the lower Extremities, by topical Compression.

OF all the topical applications hitherto employed to restrain hæmorrhage in general, and that consequent to amputation in particular, (the ligature excepted) *spongy or fungous substances* have justly obtained the preference*.—There is however some reason to believe, that those substances

Z

owe

* I made use of sponge for the stoppage of hæmorrhage in all cases indiscriminately, for near three years, in which time there were nineteen amputations of the extremities, fourteen of which were of the thigh; and it never failed except in one instance.—*Cases in Surgery with remarks, part first, by Mr Charles White.*

owe this preference, not to any extraordinary astringent powers peculiarly inherent in themselves: by which they may be supposed capable either to coagulate the blood in the bleeding vessels, or to constrict the orifices of the vessels themselves. As they must always be assisted by considerable compression, before they produce any effect; it is more likely that their action is in a great measure mechanical: their peculiar elastic structure very well qualifies them to act in this manner.

PROPERLY to support these fungous substances, when applied over the bleeding vessels; or, closely to retain them there, till the vessels, by their natural elasticity, contract, or till their sides concrete, or both;—seems to be the chief difficulty attending their use: this observation may be illustrated by the following cases,
published

published by Mr White of Manchester,
an expert and able Surgeon.

“ W. SMITH, affected with hectic fever and its concomitants, from ulcers of the ankle, attended with *caries*, and in consequence extremely reduced; had his leg amputated in the usual place below the knee. Upon slackening the tourniquet, the arteries bled freely. I covered the whole stump with pieces of dried sponge, applied over these the common dressings; and retained them on by no tighter a bandage, than what was just necessary to keep the sponge in contact with the mouths of the divided arteries: the tourniquet was let loose, in about fifteen minutes after the operation. I now recollected, that I had omitted to cut the interosseous ligament: but as the stump was dressed, and the patient in bed; I was, for the present, unwilling

ling to disturb him. In about an hour an hot fit came on, and an eruption of blood soon after succeeded ; but it was immediately suppressed, upon the application of the tourniquet by a person whom I had left in the room. I returned soon after, and, removing the dressings, discovered, as I expected, —that the effusion of blood proceeded from the *tibialis antica*. I, therefore, with a knife, divided the interosseous ligament ; and re-applying the sponge, in about a minute afterwards I slackened the tourniquet. It appeared, however, that the sponge had not time enough to secure its situation ; for this reason it was necessary again to tighten the tourniquet. The sponges, which were saturated with blood, were removed ; and I applied fresh pieces to the extremities of the vessels : pressing that which I had placed upon the *tibialis antica*, tightly down between
the

the separated edges of the interosseous ligament. A second piece was applied over this, and a whole undried sponge was placed so as to cover both; these were all retained by four cross-slips of good sticking plaister: and, to render them still more secure, I took a double-headed bandage, bended the knee,—and bringing the middle of it to the extremity of the stump, passed each end several times over the knee and back again; making the compression something tighter than usual. I did not however turn it round any part of the limb; circular bandages, when applied too tight, being frequently prejudicial. In less than an hour the tourniquet was intirely slackened; and I had no farther occasion to repeat its use, not the least effusion of blood succeeding. The great heats under which my patient laboured, the thinness of his blood, and excessive quickness

ness of his pulse,—made me think all the precautions I had taken necessary. As I was convinced the sponges must have sufficiently secured themselves, I removed the tight bandage early the next morning; and the sponges were taken away a fortnight after the amputation,—not the least difficulty, or least effusion of blood, attending their removal.”

“ THE sponge never failed me, except in one instance: which was after amputating the thigh of a young gentleman, who had a white swelling in the knee, attended with constant convulsive twitches in his leg and thigh, so great as to raise the limb every five minutes from the pillow; these twitches continued after the operation, and would never allow the sponge to adhere. After some ineffectual trials of it, I secured the femoral artery with the
the

the needle and ligature; and the patient went on very well for three weeks, so as to be able to sit up many hours in a day, to read and write, and play on the flute: but, about the expiration of that time, he was seized with the symptoms of the locked jaw, and died in a few days*.”

IN all cases of amputation in the lower extremities, the sponge may be kept most accurately applied to the orifices of the vessels, with any degree of force,—by the very same *apparatus* recommended above for the flap-operation. It would very probably have succeeded in both the cases above mentioned, particularly in the latter one; because it infallibly confines the limb, as was before observed, to the same level

* See his cases in surgery, with remarks, part first, p. 151. and 168.

level with the body: and consequently would have prevented the convulsive twitches from raising it from the pillow, and thereby defeating the action of the sponge. I am persuaded, the vessels of the leg might be thus stopped by compresses of lint only, without the assistance of the sponge.

THE oozing of blood from the general surface of the stump, which sometimes happens,—may be staved by the very same means proposed for the flap-operation, and for the retention of spongy or fungous substances over the bleeding arteries.

Of

Of FRACTURES of the PATELLA.

THE *patella*, *rotula*, or *knee-pan* is sometimes, though very unaccountably, fractured in a longitudinal direction with respect to the leg. This bone, however, for very evident reasons, is much more frequently fractured in a transverse direction.

THE cure of transverse fractures of this bone is rendered very difficult by its flat roundish form, by the neighbourhood of the knee-joint; but especially by the contraction of the very strong extensor-muscles of the leg, which are attached to its upper edge: sometimes it is so unequally divided, that only a very small fragment ad-

A a

heres

heres to the tendons of the extenfor-muscles ; a circumstance which adds very considerably to the difficulty of retention.

LIKE all other fractures, the cure here is to be attempted by approximating and keeping contiguous the fragments of the bone ; to effect which, the extended posture of the leg is absolutely requisite.

M. PETIT, to effect retention of the fragments of the *patella*, prescribes as many *cómpresses* of various shapes, and as many bandages and rollers, of different lengths and breadths, as would require a great measure of patience properly to apply. The retentive powers of all soft pliant bandages, however dexterously they may be applied,—are here feeble, and for the most part inadequate: and when employed during
the

the whole process of the cure, (which I have known eight weeks insufficient to obtain,) the patient must be confined to bed; at least, the affected limb must be moved with the greatest caution.

FROM the inspection of Fig. I. Plate 4. it will be evident,—how perfectly the retention of transverse fractures of this bone may be accomplished; by the circular of the leg-machine, and the inferior one of the thigh-machine, connected laterally together by the jointed graduating splints EE. The back edges of these splints are to be turned forward, to prevent all flexion of the knee-joint: proper compresses of folded linen are also to be interposed betwixt the circulars and knee-pan, especially betwixt it and the upper one. The graduated connecting splints allow the circulars to be
more

more or less approximated, as may be necessary.

It will be observed, that as all motion of the knee-joint, by this mode of retaining the fractured *patella*, becomes impossible; the necessity of confining the patient to bed for any length of time, is superseded: on the contrary, he may move about with a good deal of safety after a few days. The circulars require to be applied with much less strickness, than the roller-bandages commonly employed.

It will also be observed, how well the retention of longitudinal fractures of this bone, (if at any time such should happen) can be effected; by interposing compresses betwixt it and the lateral connecting splints.

If the fragment adhering to the tendons

dons of the extensor-muscles is small, and it is thought necessary to make use of pressure along the course of the *rectus-femoris*-muscle, with a view to obtain a temporary diminution of the contractile power; this may be easily, conveniently, and effectually accomplished: by adding the upper circular and graduating splints of the thigh-machine, as before taught; and interposing compresses with any requisite degree of force betwixt the thigh and fore splint, along the course of the muscle above named.

THE method of cure here proposed for fractures of the *patella*, will answer equally well,—if at any time the ligament connecting it with the *tibia*, is ruptured.

Explanation

Explanation of PLATE IV.

FIG. I.

REPRESENTS the body from the top of the *pelvis* downwards.—The right leg is supposed to be amputated.

THE right thigh represents the method of applying the thigh-machine, to prevent retraction of the skin and muscles, &c. after amputation.

AA. PART of the adhesive plaster which surrounds the thigh, appearing above the circular.

BB. THE inferior circular made purposely somewhat broader than common; gently to support the soft parts, and to project some inches over them.—It is supposed to be covered with wax-cloth,

cloth; to prevent the matter discharged by the stump, from penetrating.

C. THE tape-straps which come from the inferior edge of the adhesive plaster, included within the circular; and reflected over its edge from within outwards.—They are supposed to be securely pinned all round to the wax-cloth, which covers the circular.

DD. THE two stuffed straps, which are fixed to the back part of the upper circular (Plate I. Fig. 1. BB); and pass betwixt the thighs from behind forward,—tied by their forked extremities, to its fore-part.

THE left limb shews how the thigh and leg-machines may be connected by the jointed splints EE, so as to allow motion of the knee-joint. The fore-splint is here supposed to be abstracted from

from the thigh-machine; by which means, and by the help of a joint near the head of the lateral splint which extends up the inside of the thigh to the *os pubis*,—motion of the thigh on the *pelvis*, is also permitted: as are also flexion and extension of the foot on the leg, so that it will be evident the patient is still at liberty to walk. In cases of weakness of the whole limb, or of a particular joint, or before the *cal-lus* is sufficiently confirmed after fracture; the weight of the body may almost be totally sustained by this contrivance, and prevented from falling on the limb.

FIG. 2.

REPRESENTS the leg, and part of the thigh, in a side view; to shew the method in which the lateral jointed splints

splints connecting the two machines are fixed to the adjacent circulars, so as not to impede the motion of the knee-joint.

FIG. 3.

REPRESENTS the shape which the sticking-plaster to be applied round the thigh or leg, to prevent retraction of the skin, &c. may have ; with the tape-straps affixed at small intervals to its inferior margin.

FIG. 4.

REPRESENTS a thin piece of wood, with a strap fixed to its back part to secure it to the splints; when applied over the opening or mouth of the circular, in the flap operation, &c.

B b

FIG.

FIG. 5.

REPRESENTS a piece of iron with three branches, to be applied over the mouth of the circular; for the purpose of making the straps from the plaster converge into a point, over the centre of the stump.

FIG. 6. and 7.

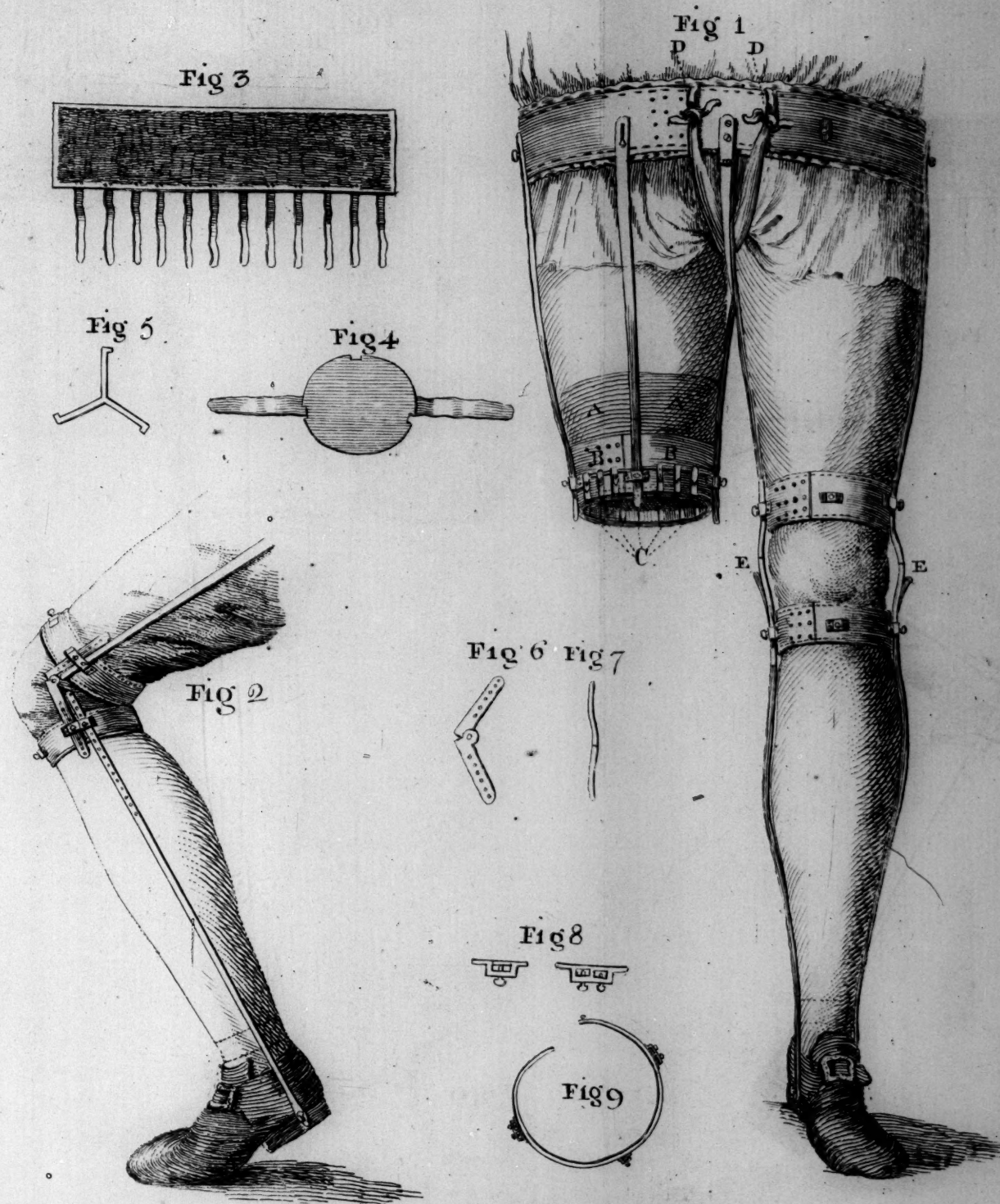
REPRESENT the jointed connecting splints, in two views.

FIG. 8.

REPRESENTS a side view of a single and double iron screw-plate, provided with flat headed screw-nails; to catch in the impressions of the splints, as they pass through the plates, when riveted upon the circulars.

FIG.

PLATE IV



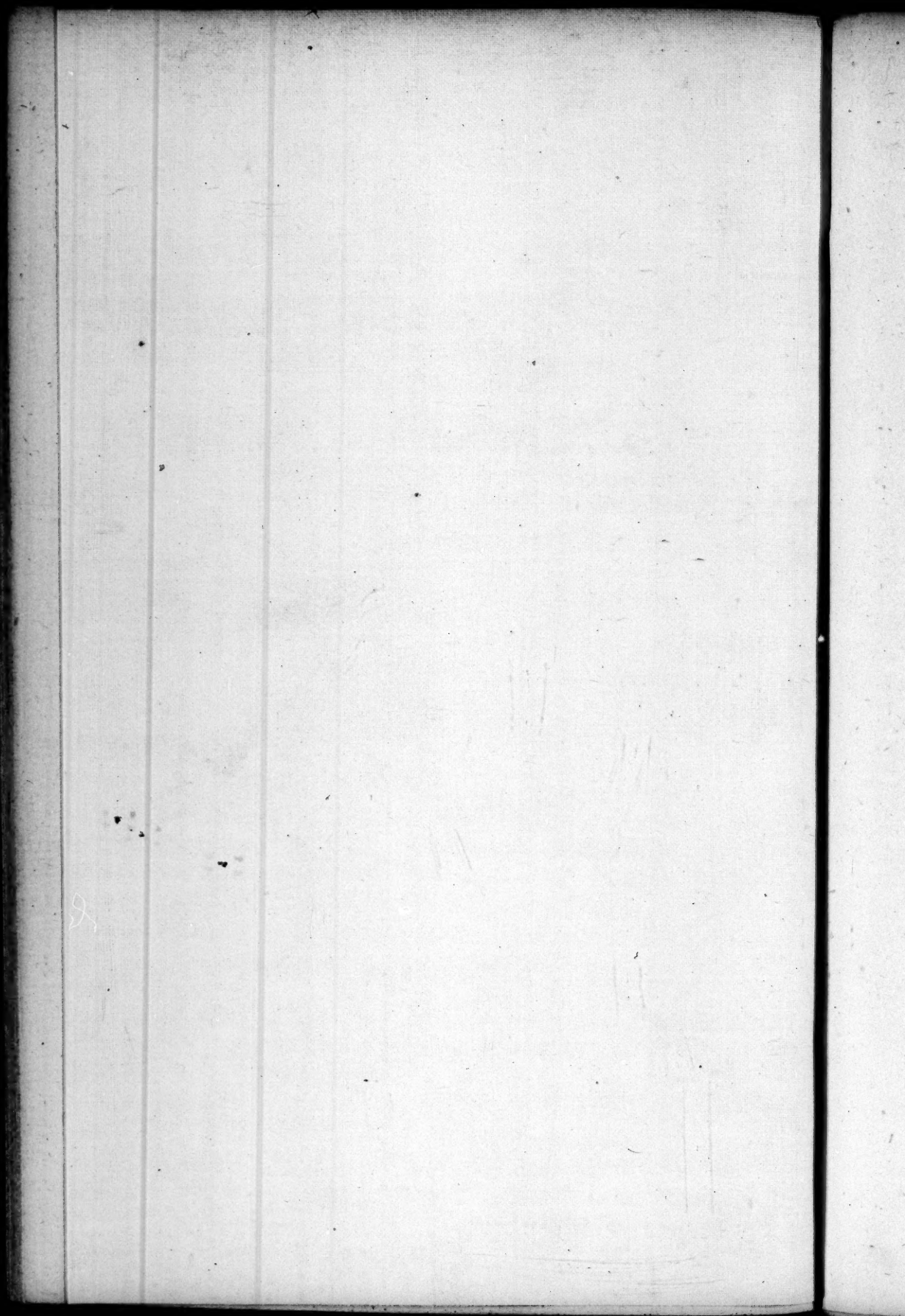


FIG. 9.

REPRESENTS one of the circulars at the knee in a side view,—with two double, and one single iron screw-plate, riveted to its external surface; also the stud on one end, which fixes it about the limb, by passing through a corresponding hole in the other end.

of

197

Of extracting Teeth.

THE extraction of teeth in many cases, and for many reasons, is an operation not only expedient but necessary. Among the various instruments recommended for performing it, the *key-instrument* is generally preferred. This instrument, notwithstanding, is far from being complete or faultless; I shall here only take notice of two of its defects, which are very capital.

I. THE *very oblique or bad direction in which it draws or acts*, viz. at an angle very seldom less, sometimes greater than a right one, with respect to a perpendicular line passing through the

the *axis* of the tooth (Plate VI. Fig. 2.). The most natural direction in which teeth can be drawn, seems to be the perpendicular one, or straight upwards. Teeth with divergent, crooked and long fangs, or which have contracted osseous adhesions with their sockets, (beside other circumstances,)—render the drawing of them in this direction extremely difficult or impracticable: however, wherever it can be performed, it seems justly to claim the preference to every other direction; particularly to that in which the common instrument draws, which is nearly the worst possible. Supposing it were the operator's wish and intention, either to break the sockets or the teeth; scarcely could he find, perhaps invent, an implement better calculated to fulfil his purpose, the blacksmith's pincers not excepted. By experiment it has been found, five times in six, to break the
sockets

sockets even of teeth previously extracted, and loosely replaced; and sometimes to break the teeth themselves*.

2. *ITS bruising effects on the gum.* The heel of the key-instrument has been variously modeled and protracted, with a view to lessen the obliquity of its action;—while little or no advantage is gained by this device, with respect to direction, its bruising effects on the gum seem by it rather to be increased. In whatever way the heel may be fashioned, these effects are, and will be, very considerable; for it acts on the gum with the same (according to some, with twice the) force which the instrument exerts on the tooth; and that

* In the British, and from that transcribed into the Scots Magazine for January 1763, there is a very sensible paper on this subject; where an instrument, and the *modus operandi* for drawing the teeth perpendicularly, are described.

that on a very small portion of it, and in the most unfavourable way. For the heel of this instrument, especially when protracted, may be regarded as a centre and *fulcrum* about which the claw moves, and on which the instrument rests while operating: and although the side or flat part of the heel be parallel with the surface of the gum, when the instrument is first applied or fixed; the very moment it begins to act, the whole heel, its inferior part or angle excepted, must recede from the gum: a circumstance which, according to the form of the heel, throws the whole pressure upon a point or a line*; by which the gum, previously much inflamed, is intolerably bruised; and this joined with the fracturing of the socket, very well account for the most exquisite

* A sphere can only touch a plane in one point, and a cylinder can only touch it in a line.

quisite pain so universally complained of.

THOSE who advise the extracting of the teeth in a perpendicular direction, allow that it is often necessary, the more effectually to disengage them from their sockets, to carry them a little to one side; and that the extraction in all cases is much facilitated by this practice*: it may be then concluded, that the most successful and favorable direction for drawing teeth, is one not altogether perpendicular, but at as small an angle with it as possible, (Plate VI. Fig. 3. and 4. BE). An instrument constructed, so as to be capable to do this without bruising the gum, would seem tolerably complete.

Explanation

* I would always advise, after the first effort in the straight direction, to twist the tooth a little outwards, for it greatly facilitates the extraction in all cases; and unless it be begun too soon, or carried too far, never hurts the socket, &c. — Brit. Mag loco citat.

EXPLANATION OF PLATE V.

FIG. 1.

REPRESENTS an instrument for drawing teeth, of a *new construction*; which repeated trials on the dead and living subject, show to be, among others, possessed of the qualities last mentioned. It may justly enough be regarded as the key-instrument, with some variation of form, lodged in a *case*.

By turning the handle HH, the claw and part G are only moved; which therefore may be called the *handle of the claw*. By turning the handle c, the *canula* ABA and heel DD, or what I call the *case*, are only moved; this, therefore may be named the *handle of the case*. The handle of the claw introduced into the *canula* of the case, consti-

C c

tute

tute the *common handle* KABA. To prevent this instrument, when employed to draw the teeth inwards, from hurting or pressing on the fore-teeth,—the common handle joins the heel at an angle some degrees greater than a right one, as expressed by the doted line.

FIG. 2.

REPRESENTS the part of our instrument, which resembles the key-instrument. The claw is here considerably raised above the *axis* of the handle; whereas it is generally placed below it in the common instrument. The claw is secured by a screw-nail to the part G, through which there is a square hole to receive the extremity of the handle, which is likewise square; by which means this handle turns the
claw

claw independent of the case, which is here marked out by the pricked lines.

FIG. 3.

REPRESENTS the case by itself: the dotted lines show how the key-instrument (as represented in Fig. 2.) is received or lodged in the case: the handle of the case *c* is provided with an octagonal hole of such size, as easily to receive, and move backwards and forewards upon the octagonal portion *AB*, of the *canula* of the case, (as in Fig. 1. *c*). This circumstance prevents the handle from moving round, without carrying the whole case along in the same direction. There is a *rest* or flat moveable piece of iron *F*, by which the case is as it were suspended on the tooth or teeth next to the one to be extracted; and is thereby prevented in the

the act of drawing, from falling so low as to hurt the mouth when drawing inwards,—or the joining of the cheeks and lips with the gum, when drawing outwards. This *rest* is made of such a length as to cover more than one tooth; lest the one immediately on either side of the tooth to be extracted, should be wanting: it can occasionally be fixed to the heel on the opposite side of the claw, where a hole is provided for it; or there may be two *rests* at the same time, as in Plate VI. Fig. 5. and 6. Although I regard these rests as very useful,—yet I have often operated with this instrument without them, with great satisfaction. The pressure of the *rests* on the neighbouring teeth, is very inconsiderable.

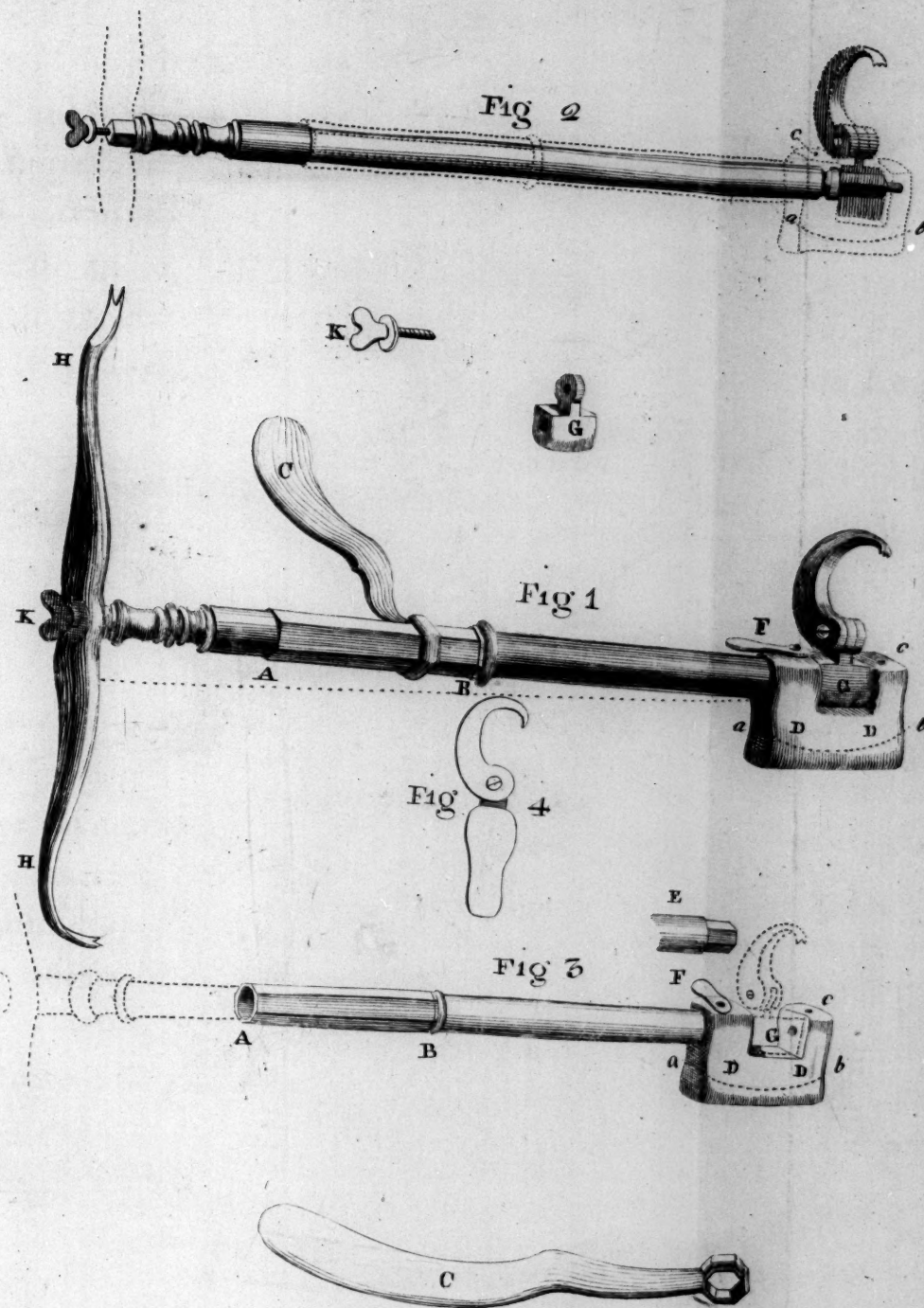
It surely is an absurd, though common practice, to use an instrument of the same dimensions on every patient, however

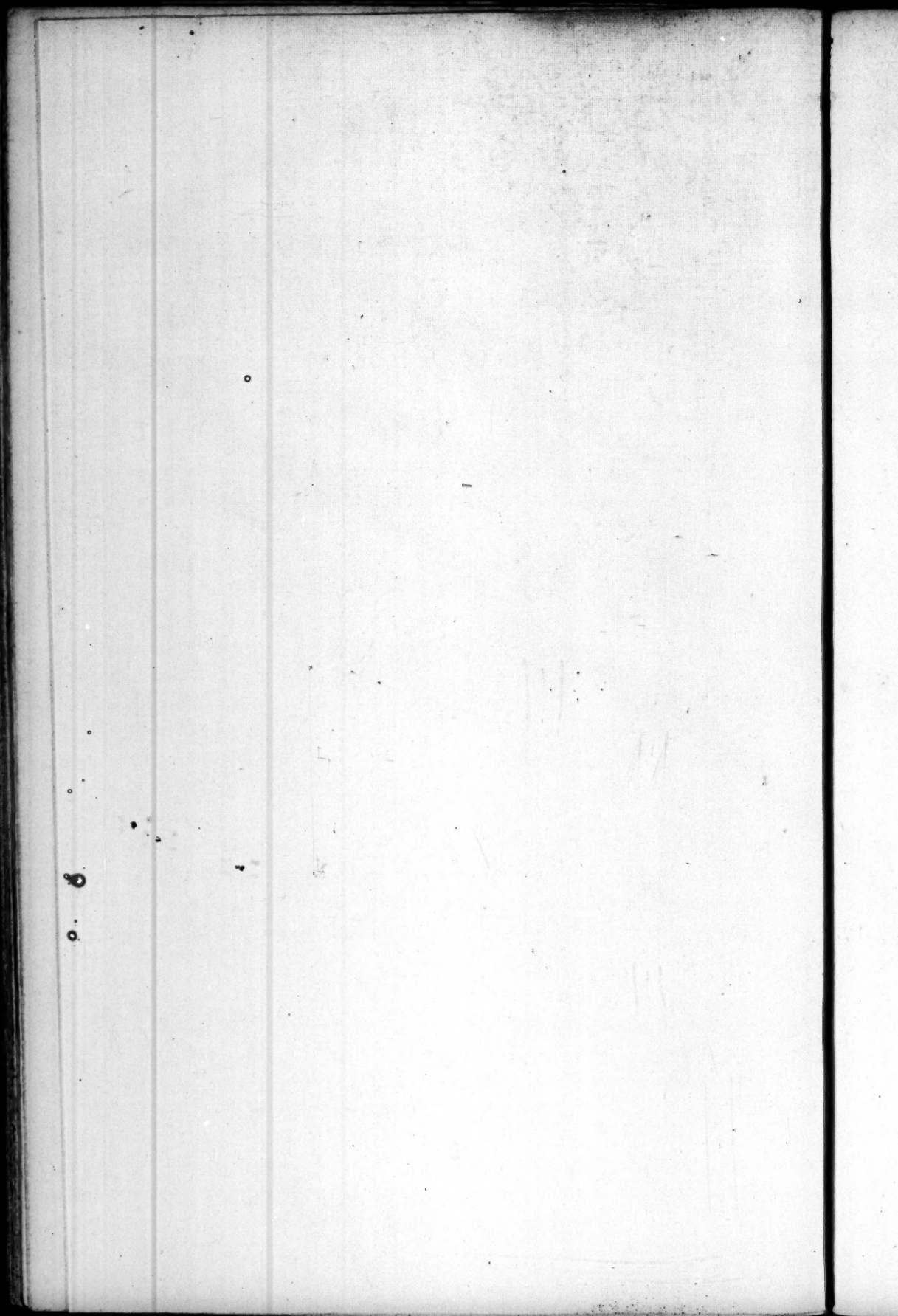
however different the size and shape of the jaw-bone and teeth may be. Therefore, that heels of proper and and proportional shapes and sizes might occasionally be fixed to the same handle,—the heel DD is removeable from the canula or other part of the case ABA; the part of the canula which enters the heel is shaped as at E; the same screw-nail, which fixes the *rest* to the heel, also passes through the part of the canula which is inserted in the heel: and, by catching in a notch purposely made in the handle of the claw, as at c in Fig. 2.—it thus both fixes the two parts of the case together; and prevents the handle of the claw from falling out, or from being withdrawn, unless the nail is previously turned. When the *molars* of the upper jaw-bones are to be drawn inwards, the heel may be made of a roundish form, as marked by the prick-
ed

ed line a b ; and a little thicker than ordinary, to prevent the palatal process of the maxillary bones from being injured by its pressure. I have heard of a case, where, by the heel of the common instrument, this process was broke,—and pushed up into the nose.

THE same observation may be made with respect to the size of the claw. It would evidently be preposterous to use one of the same size indiscriminately to draw small and large teeth, *e. g.* the *incisores* and the *molars*. The claw for this instrument describes a greater section of a circle, and is more turned in at the point than that of the common instrument; it is also pretty sharp at the point, to lay firm hold of the tooth: for, as this instrument draws in a direction much more perpendicular than the common

PLATE V





common instrument, it is other-
ways apt to slip over the tooth.
Fig. 4. gives a profile view of the
claw and heel of this instrument.

Explanation of PLATE VI.

FIG. I.

REPRESENTS the manner of hold-
ing, applying and operating with
this instrument. It is supposed to
be fixed on one of the *molars* of the
right side of the lower jaw-bone;
(Fig. 3. shews how the claw fix-
es on the tooth): the left hand
manages the handle of the case c,
so as to preserve the flat side of the
heel (which is here represented as co-
vered with soft rag) constantly and
accurately parallel with the surface of
the gum; the fore finger of the same
hand

hand reaches forward to press upon the claw : the handle of the claw H is held by the left hand, the fore-finger of which is stretched along the instrument. The tooth is extracted or elevated with surprising facility from its socket, in an almost perpendicular direction (Fig. IV. B E)—by turning the right hand with the handle of the claw H, a very little from right to left. The *molares* of the opposite side are extracted in the same manner,—by only reversing the claw, and changing hands.

THE part of the heel of this instrument DD is a little hollowed, to lodge the prominent part of the gum; that the pressure, when the heel is properly managed, may be equally divided over every part of the gum covered by the heel: the consequence is, that the patient feels very little pain from the heel,

heel, or the gum is not in the smallest degree bruised.

THE part G, or heel of the claw, is sunk about a twelfth part of an inch below the surface of the heel of the case DD. It is of sufficient breadth to receive any of the *molars*; so that the tooth, on which the claw is fixed, is only allowed to deviate from the perpendicular about the twelfth part of an inch (Fig. 4. A B): a space hardly sufficient to disengage the fangs from the socket, and to facilitate the extraction; while it is not so great as to endanger the bursting of the socket.

It will now be understood, that this instrument applies, with equal propriety, ease, and safety,—to extract the teeth of either jaw-bones, inwards or outwards; whether the *molars*, *cani-*

D d

ni,

ni, or *incisores*. When the *canini* or *incisores* are to be extracted outwards, the heel of the case must be made concave (as in Plate VI. Fig. 6.); to apply equally and easily to the convexity of the jaw-bone: when they are to be extracted inwards, the side of the heel which applies to the gum is to be convex (as in Fig. 5.), for the same reason for which it was in the other case concave.

THE structure of our instrument is evidently more complex than that of the common instrument; but this circumstance can afford no reasonable objection against it, if the great advantages, mentioned above, are obtained in consequence, viz. the bruising of the gum always avoided,—and the bursting of the socket prevented, wherever it is possible to be prevented; while the tooth is elevated from its socket,
et,

et, in an almost perpendicular direction, with as little pain as is consistent with the extraction of a tooth.

I SAID above, that the bursting of the socket was prevented by the use of this instrument, wherever it was possible to be prevented; for Surgeons, of the greatest experience in this branch, confess, in many cases, this accident is not to be avoided,—by any dexterity, device or artifice whatever*: all I contend for is, that, by operating with this instrument, as above taught, this disagreeable, painful, and

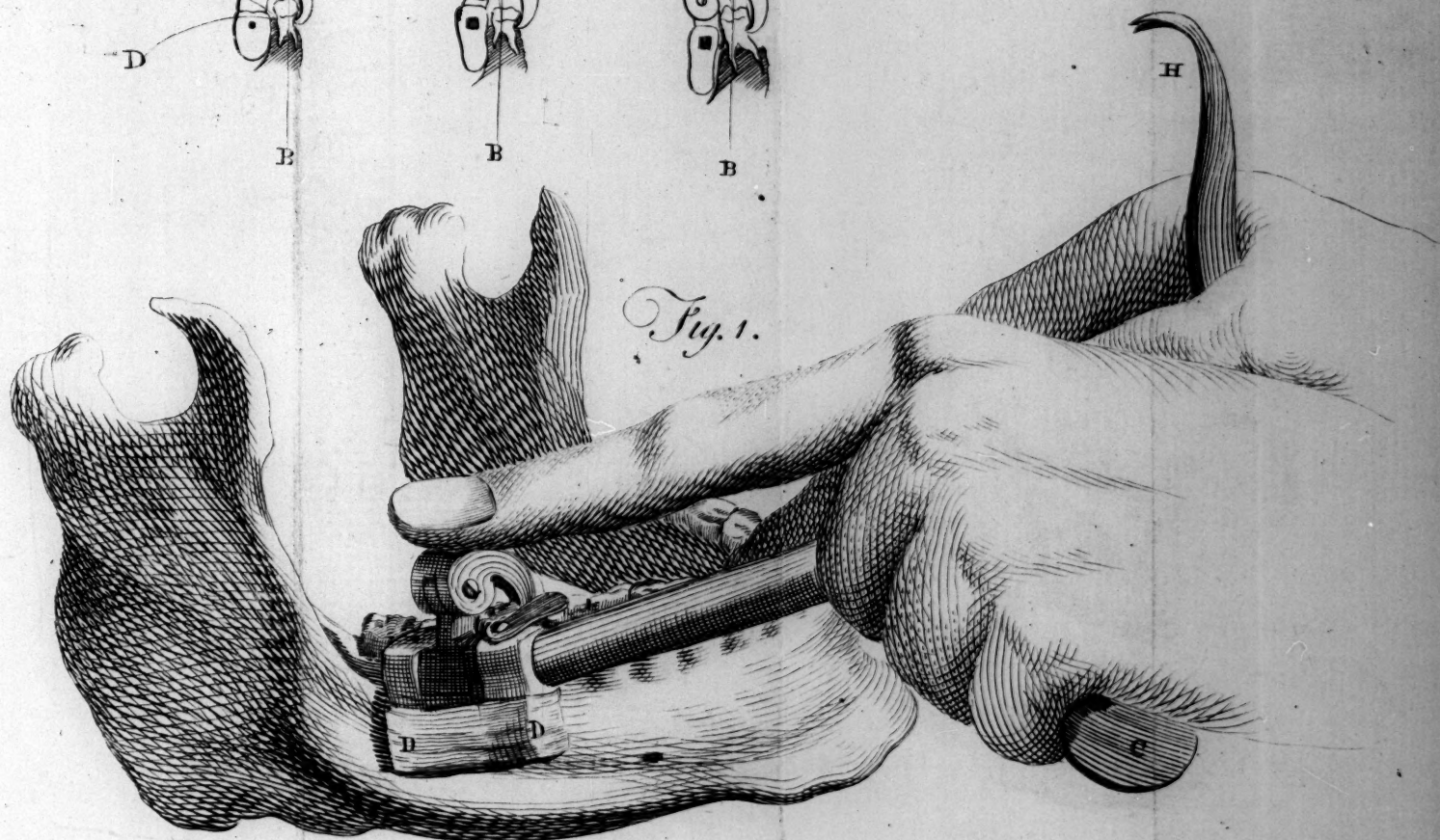
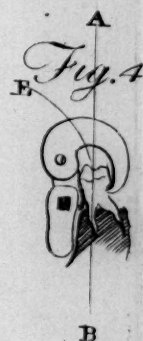
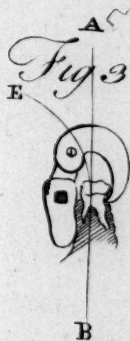
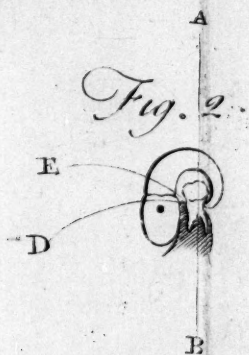
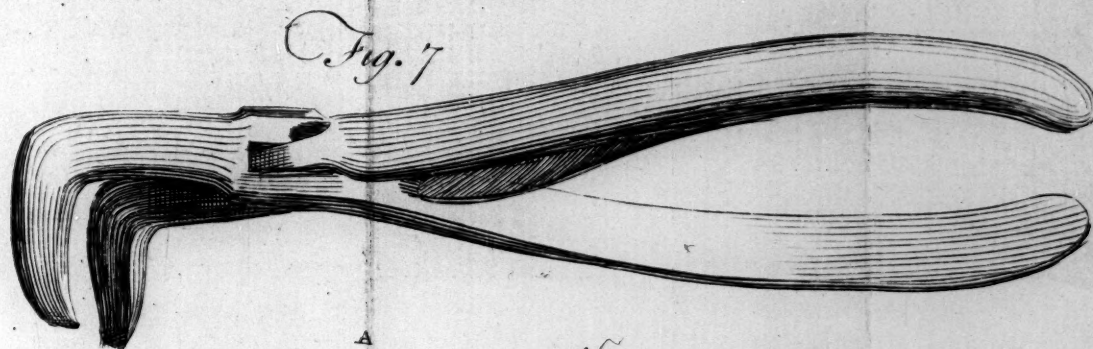
* It often happens, that there are very strong osseous adhaesions between a tooth and its sockets; and it happens as frequently, that the roots go off in various directions; which render it impossible to draw the tooth without breaking some of these, or the edge of the socket.—*Brit. Mag. loc. citat.*

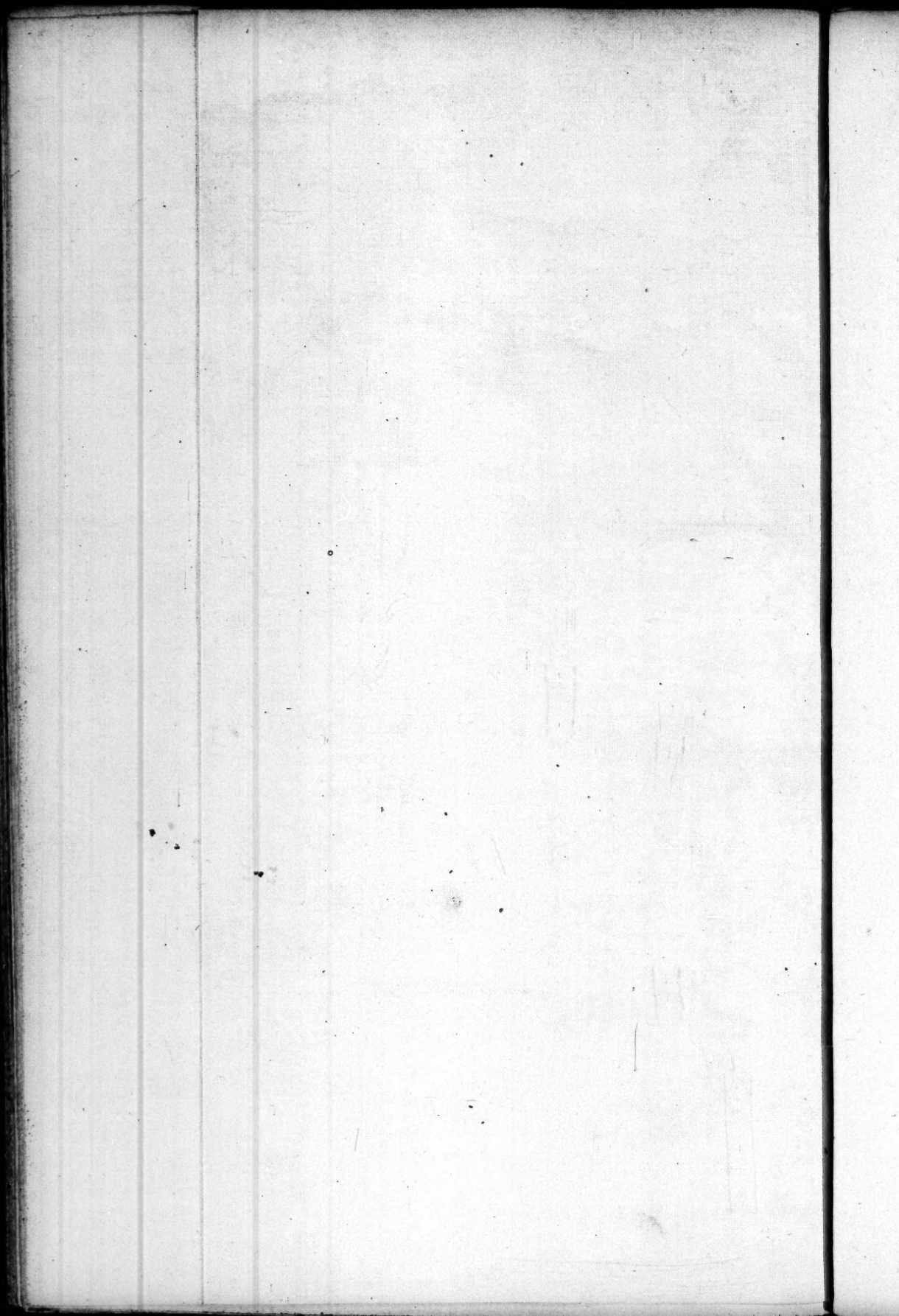
See M. Fouchard's *Chirurgien dentiste*, Tom. II.
Pages 210, 211, 212.

and sometimes dangerous accident, is, in many cases, avoidable, where it inevitably happens from the use of the common instrument.

As the handles of the claw and of the case (Plate V. Fig. 1. HH, and c) are both removeable at pleasure from this instrument, it becomes in consequence abundantly portable; — the handle of the case is thin at one end; to serve for a screw-key to turn the nails of the claw and heel, when necessary: the handle HH is here purposely made of steel; with one extremity it acts, in extracting stumps, as a punch and lever, — with the other, as a hook or a lever of another form.

IN Plate VI. Fig. 7. I have represented the crows-bill *forceps* somewhat different, in the shape of its points, from that commonly used: they are bended





bended to a less angle, and are thinner at their extremities ; the more readily and securely to lay hold of a tooth, or of a stump, even supposing them below the surface of the gum.

IF my descriptions, whether of this instrument, or the machines mentioned formerly,—may seem to any, imperfect, inaccurate, or unintelligible, (which, I fear much, will indeed be the case) ; they may be furnished with the originals, from the ingenious artist* I employ.

* Mr. Boog, an Instrument-maker in this city.

F I N I S.

bounded by a high angle, and at the same time
at least a hundred feet; the town is built
and the surrounding hills of a considerable
height, even exceeding them in some
places of the town.

It is very difficult to find a better
instance of the influence of the
town on the country, than in the
case of the town of Newbury, where
the town is built on a high hill, and
the surrounding hills are of a considerable
height, even exceeding them in some
places of the town.

ERRATA.

Page 45. line 6. *For humurus read humerus*

53. 4. *Cancel compound*

116. 9. *For steel-splints DDD, read steel
splints EEE.*

*Nota, The readers will easily correct, in the perusal,
any other typographical inaccuracies which may occur.*

DIRECTIONS for placing the plates.

Plate I. To front	page 106.
II.	} 156
III.	
IV.	194
V.	206
VI.	212

ERRATA

Page 10. Line 2. For "Linnæus" read "Linnaeus".
 "Canal" corrected.
 Page 11. Line 1. For "Linnæus" read "Linnaeus".

Note. The reader will call to mind, in the passage,
 any other typographical inaccuracies which may occur.

Directions for placing the plates.

Plate I. To face page 10.

- | | |
|-----|------|
| 104 | II. |
| 105 | III. |
| 106 | IV. |
| 107 | V. |
| 108 | VI. |